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(71)Applicant : **CANON INC**

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(72)Inventor : **ABE TSUTOMU
HIKUMA MASAHIKO
SUGIMOTO HITOSHI
IKEDA MASAMI**

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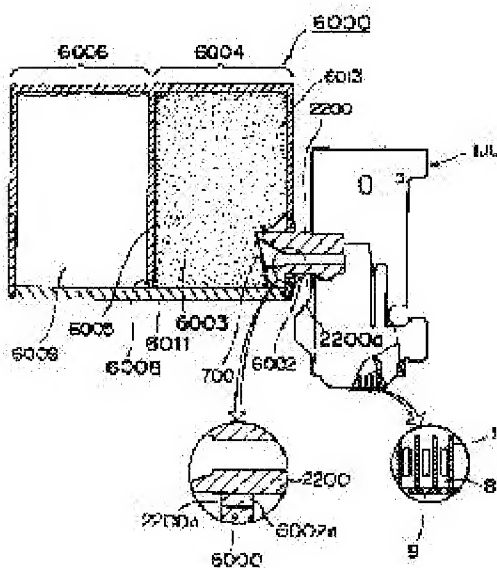
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(54) INK CARTRIDGE AND INK-JET UNIT HAVING THE SAME INK CARTRIDGE, INK-JET DEVICE HAVING THE SAME INK-JET UNIT

(57)Abstract:

PURPOSE: To provide a replacement type ink cartridge easy of attachment and detachment and load charged to a recording head is controlled in the lower limit in a time for attachment and detachment.

CONSTITUTION: A sufficient clearance is set up between the inside face 6002a of the opening part 6002 of a replacement type ink cartridge 6000 and the external wall 2200a of the ink feed pipe 2200 of an ink-jet head unit IJU.



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CLAIMS

[Claim(s)]

[Claim 1] In the ink jet unit which has the ink cartridge which holds the ink for supplying ink to the ink jet head and this ink jet head for carrying out the regurgitation Said ink jet head is what has the ink feed zone material which leads ink from said ink cartridge. Said ink cartridge It is what has a negative pressure generating member inside and has opening whose contact [material / said / this negative pressure generating member and / ink feed zone] is still enabled. This opening The ink jet unit characterized by being what forms a gap between said ink feed zone material when it is in the condition which said negative pressure generating member and said ink feed zone material contacted.

[Claim 2] It is the ink jet unit which has the pressure-welding member which intervenes between said gaps and atmospheric air in an ink jet unit according to claim 1 after said ink jet head and ink cartridge have joined together further, and is characterized by preparing this pressure-welding member in either an ink jet head or an ink cartridge.

[Claim 3] It is the ink jet unit characterized by carrying out elastic deformation rather than the ingredient with which said pressure-welding member constitutes said ink cartridge in an ink jet unit according to claim 2.

[Claim 4] It is the ink jet unit characterized by having the device which said ink jet head makes ink produce air bubbles in an ink jet unit according to claim 1 using heat energy, and carries out the regurgitation of the ink with generation of these air bubbles.

[Claim 5] In the ink cartridge which has the negative pressure generating member hold room in which it is the ink cartridge which holds the ink for supplying an ink jet head, and a negative pressure generating member and this negative pressure generating member are held It has opening for being prepared in this negative pressure generating member hold room, and making the ink engagement member and said negative pressure generating member of said ink jet head connect. This opening The ink cartridge characterized by being what forms a gap between said ink feed zone material after ink feed zone material and a negative pressure generating member have contacted.

[Claim 6] The ink cartridge which holds the ink for supplying ink to the ink jet head and this ink jet head for carrying out the regurgitation, In the ink jet equipment which has the ink jet unit which has the ink feed zone material which is prepared in said ink jet head, and leads ink from said ink cartridge It is what said ink cartridge has a negative pressure generating member inside, and has opening whose contact [material / said / this negative pressure generating member and / ink feed zone] is still enabled. This opening When it is in the condition which said negative pressure generating member and said ink feed zone material connected Ink jet equipment characterized by having the carriage which forms a

gap between said ink feed zone material, and carries said ink jet head unit removable, and the migration means to which this carriage is moved.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention is usable to the textile-printing device which prints an image etc. on record devices, such as a copying machine which uses an ink jet technique, and facsimile, communication equipment, cloth, etc. about an ink jet unit and ink jet equipment equipped with the ink container which stores the ink supplied to an ink jet head, and this ink container.

[0002]

[Background of the Invention] In various devices, such as a printer, facsimile, and a reproducing unit, an ink jet recording device is being widely used as a means which records on recorded media, such as paper and cloth.

[0003] It is made to build in device cases, such as the various electronic equipment which created and inputs the example which the ink jet recording device has composition which carries out the regurgitation of the ink to the recorded media concerned from the recording head which countered recorded media, dedicates in the device case which became independent as an ink jet recording device, and has been considered as the simple substance configuration, and recording information, for example, a word processor, and a personal computer, and there are electronic equipment and a really constituted example.

[0004] While being able to supply the ink corresponding to the amount of ink generally breathed out from a recording head at the time of record good to the configuration of the ink hold section currently used for these ink jet recording devices, it is required that there are no un-arranging from a delivery, such as ink leakage, at the time of un-recording. Usually, the configuration of the ink hold section adopts cartridge form, and is made exchangeable.

[0005] Moreover, the ink hold section for ink jets may be united with an ink jet head in order to realize the miniaturization of a recording apparatus. In this case, if it stops being able to carry out the regurgitation of the ink of ink hold circles from an ink jet head, it will be discarded with a head. However, ink remained in the ink hold section, and even if the amount of the ink which remains in these ink hold circles added amelioration, it was governed by the ink maintenance capacity of the sponge which is the negative pressure generating object of ink hold circles mostly contained by the whole for the above-mentioned ink leakage prevention, and became [many / comparatively]. Furthermore, before the engine performance of the recording head itself fell, it will be exchanged with the ink hold section and the recording head had had serious effect to a cost rise and cost performance of a product.

[0006] As a cure to the above-mentioned cost rise etc., the gestalt which unifies a recording head and an ink cartridge removable is adopted, and the configuration which enabled exchange of only an ink cartridge is mentioned. In this case, desorption of an ink cartridge can be smoothly performed by Hazama with a recording head, there is no ink leakage in the case of that desorption etc., and a load is required to supply ink to a

recording head certainly at the time of wearing.

[0007] It is indicated by JP,63-87242,A as a gestalt of the ink hold section of the recording head used for the conventional ink jet recording device, and one. This is the ink jet unit equipped with two or more ink injection orifices by which foam was arranged in ink hold circles. In this ink hold section, in order to store ink in porous media like the polyurethane foam which is foam, generating of the negative pressure by the capillary tube force of porous media and maintenance of ink, i.e., the ink leakage prevention from the ink hold section, are attained.

[0008] However, since [of ink hold circles] porous media were mostly needed for the whole, while the fill of ink was restricted, there were many amounts of ink which remain without being used into porous media, and there was a problem that the utilization ratio of ink was bad. Moreover, since it was filled up with ink into porous media, the technical problem that residue detection of ink was difficult and it was still more difficult to keep the negative pressure of ink hold circles almost constant during an ink consumption period occurred.

[0009] The technique which added amelioration that this technical problem should be solved is indicated by JP,2-522,A. The ink jet record cartridge which connected between a primary ink stores dept., a secondary ink stores dept., and ink jet recording heads with this official report by the porosity member is indicated. In such a cartridge, improvement in the utilization ratio of ink is enabled by having arranged the porosity member only all over ink passage, without an ink stores dept. building. Moreover, since the outflow ink from the primary ink stores dept. which originated in air expansion of the primary ink stores dept. accompanying the pressure drop by the temperature rise by preparing a secondary ink stores dept. can be collected, the negative pressure to the recording head at the time of record is uniformly maintainable on parenchyma.

[0010] However, since the negative pressure generating member had been arranged all over ink passage, the porous media as a negative pressure generating member had sunk in ink enough, it became inadequate in the time of un-recording generating [of the negative pressure by the capillary tube force of porous media] them, and there was a problem that ink leaked from the orifice of an ink jet recording head by few impacts. Moreover, since the above-mentioned ink jet recording head is beforehand formed in the ink hold section and one, in the case of the exchange mold ink cartridge which equips an ink jet recording head with an ink cartridge which was mentioned above, the technical problem were inapplicable occurred.

[0011] Moreover, an ink jet unit is constituted using an ink jet head and an ink cartridge as removable, and in preparing in the carriage formed in the recording apparatus, the ink leakage at the time of exchange of only an ink cartridge poses a problem. Unlike the case where an ink cartridge is prepared in the location estranged from the recording head, the ink leakage in this case pollutes the inside of a recording device, and has a possibility of causing the faulty connection in the electric contact surface of a recording head and a body, dirt of recorded media, etc. Since the configuration which allots a recording head and an ink cartridge is used for this problem on carriage in recent years for the miniaturization of equipment, it is a serious technical technical problem.

[0012] And in order to pass a recording head and an ink cartridge, it is necessary to supply much ink for a short time, and what has a thick ink supply pipe is demanded again with the configuration which forms an ink supply pipe in a recording head for making

quick the recording rate of an ink jet recording device etc. Therefore, when a pressure welding was carried out to the absorber which exchanges ink cartridges, inserts an ink supply pipe, and holds ink, the ink which the absorber was pressed and compressed and was absorbing it by the point of an ink supply pipe might soil a leakage recording device or recorded media to the exterior of exudation and an ink cartridge.

[0013] Furthermore, since it was required that ink cartridge desorption should also have been easy as mentioned above, it was difficult to satisfy these all.

[0014] And since the installation location is strictly set up in order to always keep discharging performance high, the recording head mentioned above must prevent that the location shifts by external force vibration etc. From this viewpoint, there was the need of making it not push a recording head by the ink cartridge carelessly at the time of the desorption of an ink cartridge. Although adopting the configuration which an ink cartridge does not give a load at the time of the desorption of a recording head and an ink cartridge etc. is mentioned only in a certain specific direction as this cure, various kinds of direction specification-part material must be prepared in this case, and plurality-izing and enlargement of equipment will be caused.

[0015]

[Problem(s) to be Solved by the Invention] This invention aims at making small the load which an ink container covers to a recording head at the time of the attachment and detachment further for the purpose of attachment and detachment of a recording head and an ink container offering an easy exchange mold ink jet unit.

[0016] Furthermore, this invention aims at offering the ink jet unit which can maintain the engine performance for a long period of time where said ink jet unit is carried to the ink jet recording apparatus.

[0017] Moreover, it is also making into the purpose to offer the configuration which can prevent the ink leakage from an ink container irrespective of a use gestalt.

[0018]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, in the exchange mold ink cartridge which has the hold section which this invention has opening for connecting with the joint section as ink feed zone material prepared in the ink jet head, and held the negative pressure generating member, said opening proposes the configuration which has gap where the wall is sufficient between the outer walls of the joint section of said ink jet recording head.

[0019] the joint with which opening of an ink cartridge does not contact the joint section of an ink jet head by using the above-mentioned configuration -- since it is free, the ink cartridge which the external force except the force which pushes in the negative pressure generating member in an ink cartridge does not join an ink jet head, and can offer always good printing, an ink jet unit, and ink jet equipment can be offered.

[0020] And when combining an ink jet head and an ink cartridge, the configuration which prepares in one of an ink jet head and the ink cartridges also proposes the gap formed between said joint sections and openings for a wrap pressure-welding member.

[0021]

[Function] Since opening of an ink cartridge considered as the joint free-lancer who does not contact the joint section of an ink jet head according to this invention, the external force except the force which pushes in the negative pressure generating member in an ink cartridge cannot be applied to an ink jet head, and always good printing can be

guaranteed.

[0022]

[Example] Hereafter, the example of this invention is explained to a detail with reference to a drawing.

[0023] Drawing 1 is the outline sectional view showing the important section of the ink jet head (henceforth a recording head) used in the one example of this invention.

[0024] As shown in drawing 1, a recording head consists of a substrate 100 (a heater board is called below) which prepared the heat energy generating component, and a substrate 1300 with the concave heights which constitute the liquid room 7 and the ink way 8 in which it is joined to this substrate 100 and a record liquid (ink is called below) is held. This substrate (henceforth a fluting top plate) 1300 is equipped with the orifice plate 400 in which the ink delivery (henceforth an orifice) 9 for carrying out the regurgitation of the ink which was open for free passage on the ink way 8 was established in one.

[0025] Adhesion immobilization of the heater board 100 is carried out by adhesives at the support substrate (henceforth a base material) 300, and the orifice plate 400 with which temporary adhesion is carried out and a fluting top plate equips the heater board 100 so that the heat-energy generating component 1 arranged on the heater board 100 as the fluting top plate 1300 is shown at drawing 1 may be contained in the ink way 8 constituted by this junction is arranged like front sagging in the front-end side of the support substrate 300.

[0026] And sticking-by-pressure immobilization of the heater board 100 and the fluting top plate 1300 is further carried out with the presser-foot spring 500. In addition, the presser-foot spring 500 engages with a substrate 300, and has the heater board 100 and composition which pinches the fluting top plate 1300.

[0027] Ink is supplied from the ink supply route part material 600 through the ink feed hopper 1500 prepared in the upper part of the fluting top plate 1300. The ink supply route part material 600 has a projection rod, and is fixed to the support substrate 300 by inserting this projection rod in the through hole prepared on the support substrate 300, and carrying out a heat caulking to it.

[0028] Drawing 2 and drawing 3 show one example of this invention, respectively, it is the decomposition perspective view of the recording head unit equipped with two or more recording heads 2000 which have the structure of drawing 1, and illustration of the housing member of the above-mentioned unit is omitted in drawing 2.

[0029] The recording head unit of this example can equip with four recording heads in which the regurgitation [the ink of a color different, respectively] is possible, and can define the physical relationship between these recording heads correctly. In addition, gradation record is attained even if it is made to carry out the regurgitation of the ink in which the four above-mentioned recording heads may breathe out the ink of the same color, and high-speed record or the gradation expression of them according to the number of ink droplets is attained in this case, and concentration differs in the same color, respectively.

[0030] In drawing 2, a reference mark 4000 shows the ink jet head unit frame which has two or more ink jet heads. The unit frame 4000 is equipped with the horseshoe-shaped outer wall plate 4001 and three wall plates 4002 which carry out the limitation of the head attaching part 4003 for containing each recording head. The recording head 2000

explained by drawing 1 is contained by each head attaching part 4003 where the ink delivery is turned to the method of drawing Nakashita. Positioning of each recording head in the unit frame 4000 dashes the datum level established in the datum level of three directions established in each head attaching part at each recording head, and is fixed by adhesives etc. after that. In this case, in each recording head 2000, the physical relationship of that datum level and orifice needs to be set up with high precision.

[0031] In addition, it positions on the image by not the method of using above-mentioned datum level but a TV camera etc., and you may make it fix by adhesion after that about positioning of each recording head 2000.

[0032] Thus, since according to this example adhesion immobilization of the four recording heads is carried out at a unit frame, an ink jet head unit is constituted and it is made to perform exchange of a recording head for every unit, four physical relationship between recording heads does not shift by wearing actuation in the case of exchange. Moreover, according to the configuration of this example which contains each recording head in a unit frame, and was fixed to it, as compared with the configuration of the recording head which was made to carry out the regurgitation of the ink of a color which is different by the recording head of one, there is a degree of freedom on a design from the beginning.

[0033] In addition, in drawing 2, a reference mark 4005 is the porosity member which can absorb ink, and is arranged between the orifice arrangement sides of each adjoining recording head 2000. Thereby, when wiping of the orifice arrangement side is carried out with a blade, the ink adhering to a blade is absorbed and it can prevent that color ink which is different in a contiguity orifice arrangement side carries out the reattachment.

[0034] In drawing 3, the upper housing 4506 and the side-face housing 4006 are fixed to the unit frame 4000, respectively. in immobilization of upper housing, positioning of the upper housing 4506 at the time of immobilization should do by inserting one pair of pins 4504 (one side being un-illustrating) prepared in this in the hole 4011 prepared in the upper limit side of the outer wall plate 4001 of the unit frame 4000 -- moreover It is fixed by hanging the projection on the hanging plate 4505 formed in the both ends of upper housing (un-illustrating) with the elastic energization force of the hanging plate 4505 on the crevice 4010 formed in the outer wall plate. Immobilization in the unit frame of the side-face housing 4006 is made like the upper housing 4506 using the hanging plate 4008 of the pair of housing 4006, and the crevice 4007 of the unit frame 4000.

[0035] Two or more pads 4502 as electric contact by the side of a recording head 2000 were formed in the part equivalent to the outside surface of the upper housing 4506, and each of this pad 4502 has connected with the terminal 4501 which extends in the rear-face side of the upper housing 4506. Each terminal 4501 contacts the connection pad with which it corresponds on the substrate of a recording head, respectively, when housing 4506 is fixed to a unit frame.

[0036] The hole 4009 for making the ink supply pipe 2200 (henceforth the joint section) as ink feed zone material prepared in the recording head 2000 insert in the side-face housing 4006 is formed. In the condition of having assembled, it becomes the configuration which the ink supply pipe 2200 projected from this hole 4009, this supply pipe will be inserted in an ink cartridge side, and ink will be led to a recording head side.

[0037] Drawing 4 is the perspective view showing connection with the ink jet head unit IJU and each ink cartridge which were shown in drawing 2 and drawing 3. Moreover,

drawing 5 is the sectional view showing the condition of the ink cartridge having been connected with the ink jet head unit, and having constituted the ink jet unit.

[0038] As shown in drawing 4, the ink tank (ink cartridge) 6000 corresponding to each ink color is connected with a recording head by inserting the ink supply pipe 2200 of the recording head corresponding to the opening (un-illustrating) separately, respectively. Moreover, it can demount separately for every ink tank of each ink color also about the case where the ink tank 6000 is demounted from a recording head. In this drawing, 2201 is a head fixed wall for fixing two or more ink jet recording heads.

[0039] By the above configuration, when the ink of the ink tank 6000 is lost, it becomes exchangeable for a new ink tank. Thus, since exchange is possible for every exhausted ink tank, useless ink can especially be lessened in the ink jet recording device of a color, and it is effective.

[0040] In drawing 5, the supply pipe 2200 formed in the ink jet head unit IJU is inserted so that the pressure welding of the filter 700 prepared at the tip may be carried out to the absorber 6003 in the ink tank 6000. Ink 6009 is filled at the ink room 6006 which is the ink hold section, and ink is filled by some absorbers 6003 as a negative pressure generating member allotted to the plenum chamber 6004 which is a negative pressure generating room separated by this ink room 6006 and septum 6005. The absorber 6003 has prevented that can hold ink and ink leaks from opening 6002 by this according to the capillary force. Although the ink 6009 of the ink room 6006 passes a slit 6008 and is supplied to a plenum chamber 6004, this supply becomes possible by the air corresponding to the amount of ink consumed with the ink supply by the side of the ink jet head unit IJU invading in an ink tank through the atmospheric-air free passage opening 6013, and permuting it by ink.

[0041] The description part of this example is further explained to a detail, referring to drawing 1 - drawing 5. The ink tank 6000 as an exchange mold ink cartridge slides an ink cartridge 6000 to the right from the left in drawing 5 to the ink jet head unit IJU currently fixed in equipment, and a true form voice top combines the ink supply pipe 2200 as the joint section of the ink jet head unit IJU with opening 6002 to a predetermined depth location. Here, as mentioned above, between wall 6002a of the opening 6002 of the exchange mold ink cartridge 6000, and outer wall 2200a of the ink supply pipe 2200 of the ink jet head unit IJU, the point that sufficient gap is set up is important. "Sufficient gap" as used in the field of this invention has a desirable dimension beyond the components tolerance of the ink jet head unit IJU currently fixed, and the equipment component tolerance which exists between the ink jet head unit IJU and an ink cartridge 6000. The joint section outer wall of the ink jet head unit IJU can be prevented from contacting the opening 6002 of an ink cartridge certainly by setting the dimension beyond such components tolerance as the opening 6002 of an exchange mold ink cartridge.

[0042] Moreover, "sufficient gap" is defined as follows from a viewpoint of a recording head, the ink leakage at the time of ink cartridge desorption, and ink evaporation.

[0043] As shown in drawing 6, set the path of an ink supply pipe to ϕD , and the gap in the cross section of the arbitration of outside-surface 2200a of an ink supply pipe and ink cartridge opening circles wall 6002a makes the cross-section upper part to h, and makes a cross-section lower part h'. In addition, in drawing 6, what gave the same number as drawing 5 shows the same member.

[0044] When inserting the ink supply pipe 2200 in the opening 6002 of an ink cartridge 6000 first, when there is no gap, air will be pushed in with insertion actuation of an ink supply pipe, a field with much air is formed near the ink supply pipe tip, and ink supply may become a defect.

[0045] Moreover, when ink exists that a gap is minute near the opening circles wall, ink forms a meniscus by Hazama of an opening circles wall and an ink supply pipe outer wall, and when the air pushed in by the ink supply pipe tends to come out to the exterior, the ink in which the meniscus was formed may be extruded to the ink cartridge exterior.

[0046] Since the ink usually used generally becomes it easy to form a meniscus that a gap is 0.3mm or less as a cure of this, as for a gap, it is desirable that it is $h+h' \geq 0.3\text{mm}$.

More preferably, it is $h+h' \geq 0.6\text{mm}$ and meniscus formation can be barred more certainly. That is, rather than the outer diameter of an ink supply pipe, 0.3mm or more, when the path of opening of an ink cartridge is more preferably large 0.6mm or more, it can prevent ink leakage.

[0047] Moreover, when a gap is large, the ink evaporation from a negative pressure generating member poses a problem. Evaporation of ink is produced near the point periphery of an ink supply pipe, and the ink passage currently gradually formed between the ink supply way inside an ink supply pipe (un-illustrating) and the negative pressure generating member becomes thin. In this case, if recovery etc. is performed, air bubbles etc. may be drawn in a recording head and the poor regurgitation may be produced.

[0048] As an index for preventing this, if it has the relation of $(h+h')/D \leq 0.3$ more preferably, ink evaporation will be suppressed by $(h+h')/D \leq 0.6$, and extent that does not influence ink passage formation.

[0049] Actuation of the exchange mold ink cartridge of this invention is explained using drawing 5. The ink supply pipe 2200 which supplies ink to the ink jet head unit IJU is inserted, a pressure welding is carried out to a negative pressure generating member, and it is in the condition that an ink jet recording device can work. In addition, the filter 700 for eliminating the contaminant in an ink cartridge 6000 is installed in the edge of the ink supply pipe 2200.

[0050] As an ink cartridge for which this invention is used, as shown in drawing 7, you may be the thing of a gestalt inside an ink cartridge which holds the porosity member 6003 over the whole mostly. However, when it considers that the utilization ratio of an ink cartridge mentions later, the ink cartridge shown in drawing 5 is more desirable.

[0051] Hereafter, the ink cartridge shown in drawing 5 is explained. If an ink jet recording apparatus works, ink will be breathed out from the orifice 9 of the ink jet head unit IJU, and an ink suction force will occur in an exchange mold ink cartridge. Ink 6009 passes along the clearance section 6008 of a rib edge and the ink cartridge pars basilaris ossis occipitalis 6011 from the ink hold section 6006 with the suction force, is drawn in the ink supply pipe 2200 through the negative pressure generating member hold section 6004 and the negative pressure generating member 6003 as a plenum chamber, and is supplied to an ink jet head side. Thereby, except clearance section 6008, the pressure inside the sealed ink hold section 6006 declines, and differential pressure arises between the ink hold section 6006 and the negative pressure generating member hold section 6004. If record continues, the differential pressure will continue a rise, but since the negative pressure generating member 6003 is wide opened by atmospheric air with the clearance prepared between the ink feed zone material 2200 and opening 6002, or the

atmospheric-air free passage opening 6013, air goes into the ink hold section 6006 through the negative pressure generating member 6003 from the clearance section 6008 of a rib edge and the ink cartridge pars basilaris ossis occipitalis 6011. At this time, the differential pressure of Hazama of the ink hold section 6006 and the negative pressure generating member hold section 6004 is canceled. Since this actuation is repeated during ink jet record, the inside of an ink cartridge will be maintained for a certain fixed negative pressure. Moreover, except the ink adhering to the wall surface of ink hold circles, since the ink of ink hold circles can be used mostly altogether, its ink utilization ratio improves.

[0052] The own capillary tube force (or meniscus force in an ink-negative pressure generating member interface) of a negative pressure generating member etc. is discovered at the time of un-recording, and it controls that ink leaks from an ink jet recording head.

[0053] Moreover, according to the property of the ink jet head which carries out joint, the always optimal printing is attained by setting up selection of a negative pressure generating member, and the rate of the negative pressure generating member hold section and the ink hold section. Therefore, since ink capacity not only improves rather than the case where a porous body is allotted to the whole interior of the ink cartridge mentioned above, but the ink leakage from opening for supplying ink to the exterior can be prevented effectively, it is the the best for this invention.

[0054] In addition, since the exchange mold ink cartridge of this invention is corresponded to a color ink jet recording apparatus, it can be used, respectively, being able to hold the ink of each color (for example, black, yellow, a Magenta, four colors of cyanogen) in the exchange mold ink cartridge according to individual. Moreover, it is good also as an exchange mold ink cartridge which was made to unify the ink cartridge according to individual, and separated the exchange mold ink cartridge good also as an exchange mold ink cartridge or for black ink with high operating frequency, and other color ink unification exchange cartridges. Such combination is arbitrary according to ink jet equipment.

[0055] In the exchange mold ink cartridge of this invention, in order to control the negative pressure in an ink jet recording head Selection of the negative pressure generating member 6003, a configuration, and a dimension from the first The configuration of a rib edge, A dimension, the configuration of the clearance 6008 between a rib edge and the ink cartridge pars basilaris ossis occipitalis 6011, It becomes important to optimize the roughness of a dimension, the volume rate of the negative pressure generating member hold section 6004 and the ink hold section 6006, the amount of insertion to the exchange mold ink cartridge of the ink supply pipe 2200, a configuration, a dimension, the configuration of a filter 700, a dimension, and an eye, the surface tension of ink, etc.

[0056] As a negative pressure generating member used in this example, in itself, if it has the capacity to hold ink also to a self-weight and a slight vibration of a liquid (ink), a well-known member can also be used conventionally. For example, the porous body which has the curdy object which knit fiber reticulated, and a free passage hole is mentioned. ink holding power, negative pressure generating, etc. -- adjustment -- sponge, such as easy polyurethane foam and melamine form, is desirable. Since it can adjust especially in the case of form so that it may become a desired porous consistency at the time of form manufacture, it is desirable. In addition, when heat compression processing

is carried out for form and a porous consistency is adjusted further, since ink physical properties may be changed and it may have a bad influence on record grace, processing of washing etc. is needed [the decomposition product by heating is generated, and]. Moreover, although the form of a porous consistency according to it is required in order to manufacture the exchange mold ink cartridge corresponding to various ink jet recording apparatus, it is desirable to cut into the dimension of a request of form material with the specific number of cels (the number of the holes per inch) which has not performed heat compression, to carry out compression insertion at the negative pressure generating member hold section, and to adjust a porous consistency and capillary force. [0057] As mentioned above, as long as the gap of the ink supply pipe 2200 and opening 6002 is enough, it may not be limited to this configuration and both structure and a configuration may be what kind of things.

[0058] When a negative pressure generating member is a porosity member like sponge, in order to control the recess from the ink cartridge pars basilaris ossis occipitalis of a porosity member to insertion of the ink supply pipe 2200 like drawing 5 and to maintain and secure the pressure-welding side of the filter section and a negative pressure generating member, as for the edge of the ink supply pipe 2200, it is desirable to have the include angle (taper) of arbitration to the path of insertion of an ink supply pipe.

[0059] Moreover, the amount of insertion to the exchange mold ink cartridge 6000 of the ink supply pipe 2200 does not cause an ink leak etc. in consideration of the configuration of the configuration of the ink supply pipe, the negative pressure generating member 6003, and an ink cartridge 6000 etc. at the time of insertion, but it must determine not to raise an ink piece etc. on the way at the time of record. In addition, it is necessary to prepare free passage opening with atmospheric air in a plenum chamber 6004 side. This serves as a suitable means for the improvement in dependability to the environmental variation within the ink jet recording device mentioned later. If incorporation of air is possible, it is more desirable to make it as small as possible in consideration of evaporation of ink, although the configuration of this atmospheric-air free passage opening and especially a dimension are not limited.

[0060] Moreover, although the meniscus force with ink becomes strong and the ink leak from opening 6002 can be controlled if too narrow, although it is arbitrary about the configuration of the clearance 6008 between the rib edge shown in drawing 5 , and the ink cartridge pars basilaris ossis occipitalis 6011, and a dimension, the ink supply to a plenum chamber 6004 may take the force, and an ink piece may be generated at the time of use. Moreover, since a reverse phenomenon may occur if too large, it is necessary to determine in consideration of the above. In addition, it is necessary to also determine this clearance 6008 in consideration of the location of opening 6002.

[0061] Although based also on the configuration of an exchange ink cartridge, and a dimension, it is about 0.1 to 20mm preferably, and is about 0.5 to 5mm more preferably. Moreover, as long as the configuration of a rib edge is taking into consideration the location with the above-mentioned opening 6002, it may be carrying out what kind of configuration.

[0062] Furthermore, the above becomes said [the same] of the boundary section of a rib edge and a negative pressure generating member important. For example, when the negative pressure generating member is not compressed by the rib edge, since the consistency of a member is low, circulation of ink and circulation of air become

comparatively prompt, and, in high-speed record or color record, it is desirable. On the other hand, when the negative pressure generating member is compressed by for example, the rib edge, since the consistency of a member becomes high, although resistance is produced in circulation of ink, and circulation of air, failures, such as an ink leak, can be controlled to few environmental variations. Therefore, it is necessary to design these selections in consideration of the class and the environmental condition to be used of an ink jet recording device.

[0063] It is necessary to determine the volume rate of the negative pressure generating member hold section 6004 and the ink hold section 6006 in consideration of a class, an environmental condition used of an ink jet recording device. Moreover, it becomes important [relation with the negative pressure generating member to be used].

[0064] Although it can be set as arbitration according to the class of ink jet recording apparatus, also in order for the roughness of the configuration of a filter 700, a dimension, and an eye to prevent mixing of the contaminant from an ink cartridge and not to block the nozzle of a recording head, it is desirable to make it the roughness of an eye smaller than the path of an orifice.

[0065] Although a well-known thing can be used conventionally, since the ink with which the exchange mold ink cartridge of this invention is filled up does not make an ink leak etc. cause, it is desirable that surface tension chooses from the ink in which 45 or more dyne/cm and viscosity have [in / 30 dynes /or more / 25 degrees C] more preferably 1-20cps of 1-15cps physical properties cm in 25 degrees C. Moreover, although it may be filled up to the volume limit to the ink hold section in order to maintain the negative pressure immediately after exchange mold ink cartridge opening, although the fill to the exchange mold ink cartridge of ink is arbitrary considering ink cartridge content volume as a limit, as for the ink fill to the negative pressure generating member section, it is desirable to set up below to the limitation of the ink holding power of a negative pressure generating member. In addition, the ink holding power as used in the field of this invention points out the capacity that ink can be held by the member independent at the time of infiltrating ink to a negative pressure generating member.

[0066] In an ink cartridge with the ink hold section of a sealing system, to external-environment change (a temperature rise or atmospheric-pressure fall) in the condition of having been loaded into the ink jet recording device, the ink which remains in the ink room by air expansion of the ink hold section or expansion of ink is extruded out of an ink cartridge, and there is possibility of ink leak generating. Therefore, in the exchange mold ink cartridge of this invention, it is desirable to expect the air expansion volume (for a part for ink expansion to also be included although it is small) of the sealing system ink hold section according to the annular condition that the worst assumption is carried out, and to give a part for the ink movement magnitude from the ink hold section accompanying it beforehand to the negative pressure generating member hold section. However, when all are given to a part for ink movement magnitude, and the negative pressure generating member hold section, absorber insertion conditions must be made strict saying that it inserts in the condition that it inserts so that a pressure welding may be carried out as much as possible to homogeneity, or there are not Siwa and MEKURE in an absorber as much as possible so that the clearance between Hazama of the insertion condition of an absorber, a container wall, and an absorber may not be made. When this condition is not fulfilled, possibility that the above-mentioned ink leakage will arise is

size.

[0067] However, even if ink becomes extruded by the rise of tank internal pressure in the worst environment by adopting the configuration which carries out adhesion closure of the ink supply pipe and pressure-welding member as the joint section so that it may mention later, since the detailed clearance between the joint sections is blockaded with adhesives or encapsulant, it does not leak out outside. Therefore, the above-mentioned absorber insertion conditions are also eased and offer of a reliable ink jet head unit is possible.

[0068] In addition, if the installation location of atmospheric-air free passage opening is the upper part [opening / by the side of the negative pressure generating member hold section], there will be especially no assignment, but in order to separate the flow of the ink in the negative pressure generating member at the time of an environmental variation from opening, it is desirable that it is in a location distant from opening. Moreover, although the number of atmospheric-air free passage openings and a configuration, magnitude, etc. can be set as arbitration in consideration of evaporation of ink, considering only ink evaporation, it is desirable to make it as small as possible.

[0069] It is desirable to seal opening and/or atmospheric-air free passage opening by a sealant etc. at the time of the ink cartridge independent PD, and to prepare for evaporation of ink or the air expansion in an ink cartridge. It is desirable to use the compound barrier material which compound-ized reinforcing materials, aluminium foil, etc., such as compound-izing and these and paper of the barrier of a simple substance layer and the plastic film of several layers which are called a barrier material in the package field as a sealant, and cloth. It is more desirable by making the ink cartridge body quality of the material and the same quality of the material into the glue line of a barrier material, and welding with heat etc. to raise sealing nature.

[0070] Moreover, in order to control evaporation of the ink from an ink cartridge, or the inflow of the air from external atmospheric air, after inserting an ink cartridge, it is effective if the package gestalt sealed after deaerating the air in an wrapping material is taken. It is desirable to choose from a barrier material like the above-mentioned sealant in consideration of gas transmittance and liquid transmittance as an wrapping material.

[0071] A very reliable transportation gestalt can be offered without an ink leak etc. arising by choosing the above package gestalten at the time of the ink cartridge independent PD.

[0072] Although an ink cartridge body material may be what kind of ingredient conventionally used for mold goods here, it is necessary to choose from the member processed so that there might be no ingredient or effect which does not have the effect on the ink for ink jets. Moreover, it is also necessary to take the productivity of an ink cartridge into consideration. For example, an ink cartridge body is divided into ink cartridge pars-basilaris-ossis-occipitalis 6011 part and its upper part, each is really fabricated with a resin ingredient, after inserting a negative pressure generating member, ink cartridge pars-basilaris-ossis-occipitalis 6011 part and its upper part can be welded, and an ink cartridge body can be manufactured. If transparence or a translucent thing is chosen as a resin ingredient, since the ink of the ink hold section can be checked by looking from the ink cartridge outside, it can judge the replacement stage of an ink cartridge visually. Moreover, in order to make the above-mentioned sealant and joining easy, it is desirable to prepare heights in Tanggu. Furthermore, it is also desirable on a

design to process a crimp etc. on the external surface of an ink cartridge body.

[0073] restoration of ink -- an inflatable flexible bag technique and a manometric method -- any -- although -- it can be used. In addition, since other ink cartridge openings are not soiled, it is desirable to prepare ink restoration opening in restoration of ink at either of the tank bodies. As for ink restoration opening after ink restoration, it is desirable to carry out a plug with plastics or a metallic material.

[0074] The configuration and configuration of an exchange mold ink cartridge can perform various kinds of deformation, without deviating from the range of this invention.

[0075] It is as follows when the effectiveness of this example is summarized.

[0076] [Effectiveness by the joint free-lancer]

(1) Tank exchange can be performed smoothly.

[0077] (2) A register adjusted head with the low load to a head does not shift.

[0078] (3) The yield of components becomes high rough [the precision of joint opening of a tank, and the head joint section], and well, and cost can be fallen.

[0079] (4) The components yield can increase rough [the ink tank loading section guide precision of body carriage], and well, and cost can be reduced.

[0080] [The pressure-welding seal effectiveness]

(1) The ink evaporation under tank wearing is controlled and it can be used for a long period of time.

[0081] (2) The ink leak under the time of tank wearing or tank wearing is controlled, and the contamination in equipment can be prevented.

[0082] That is, since an ink jet recording head makes an alphabetic character and an image form and it is being adjusted and fixed by it within equipment, it must avoid that the external force which affects the fixed condition works as much as possible. In the case of the one apparatus head for color picture formation which arranged two or more ink jet recording heads like this example, this demand becomes severer.

[0083] Therefore, according to this example, it can prevent that external force other than external force, i.e., the force which pushes in the negative pressure generating member in an ink cartridge, like an ink cartridge body collides with the ink supply pipe 2200 as the joint section of an ink jet recording head in the case of installation of an ink cartridge or exchange joins an ink jet recording head.

[0084] Although especially the recording head unit that built in two or more recording heads for ink jets is useful as an object for color picture formation, a severer precision is required of register adjustment of each head. Also when adjusted immobilization of one head is eased even if, it is because the grace of the color picture falls remarkably.

Therefore, on the occasion of application of the exchange mold ink cartridge of this invention to such an ink jet head unit, or [to the ink jet recording head of the exchange mold ink cartridge], the force applied [be / it / under / time of the attachment and detachment from this head or duration-of-service / letting it pass] to a recording head should be made necessary minimum.

[0085] In addition, although we are anxious about evaporation of ink from the gap of the head joint section and ink cartridge opening in having mentioned above when an exchange mold ink cartridge continues at a long period of time and the recording apparatus is loaded with it, evaporation of ink can fully be controlled more to adopt the simple pressure-welding configuration in this invention shown below.

[0086] Next, other examples of the exchange mold ink cartridge of this invention are

explained using drawing 8 - drawing 9 .

[0087] Each of drawing 8 - drawing 9 is the sectional views showing the important section of the connection structure of the exchange mold ink cartridge 6000 and an ink jet recording head.

[0088] The simple pressure-welding member 2202 is arranged in a part of peripheral face 2200a of the ink supply pipe 2200 of the shape of a cylinder of the ink jet head unit IJU in (a) of drawing 8 . Itabe 2202a to which this simple pressure-welding member 2202 contacts the method of the outside of radial of the ink supply pipe 2200 with the head fixed wall 2201 of the ink jet head unit IJU in a projection and one field, It consists of projecting part 2202b of the shape of a cross-section triangle which projects towards the die-length direction of the ink supply pipe 2200 in the field of another side of this Itabe 2202a. It is formed from the ingredient softer than the ingredient with which any part constitutes the above-mentioned ink cartridge 6000 and the ink jet head unit IJU, respectively in degree of hardness. At the time of connection, the crowning is the skin of an ink cartridge 6000, and projecting part 2202b contacts near the opening 6002.

[0089] By considering as the structure which showed the simple pressure-welding member 2202 to (a) of drawing 8 , the external force to a head turns into only force which presses the negative pressure generating member 6003 at the time of attachment and detachment of an ink cartridge 6000. Moreover, external force is only slightly applied to the horizontal direction as used in the field of [are only that projecting part 2202b of the outer wall of an ink cartridge 6000 and the simple pressure-welding member 2202 touches slightly, and] this drawing at the time of installation termination. Therefore, the force applied during wearing of an ink cartridge 6000 at the ink jet head unit IJU turns into only the force which presses the negative pressure generating member 6003, and few force of contacting an ink cartridge 6000. The force can be substantially adjusted by an ink cartridge's 6000 pressing and adjusting an amount.

[0090] In addition, that the pressure welding should just be carried out in [an ink cartridge outer wall and the simple pressure-welding member 2202] simple, even if there is a partial minute gap, since it is also possible to control ink evaporation as a request, it does not interfere. Moreover, even if there is an inflow of the air from this gap to into an ink cartridge, the engine performance of an ink cartridge is not sounded so that it may mention later.

[0091] Although considered as the structure which shows the connection structure of an ink cartridge and an ink jet head unit in (a) of drawing 8 in the above-mentioned example, as mentioned above, it is not limited to such structure.

[0092] As shown in (a) of drawing 8 , as an example which performed deformation of preparing the simple pressure-welding member as the joint section in a recording head side, and modification, the structure shown in (b) - (d) of drawing 8 can be mentioned. In (b) of drawing 8 , projecting part 2202b of the simple pressure-welding member 2202 has a cross-section approximate circle form (the shape of a ring [The whole]), and simple pressure-welding member 2202 the very thing serves as a cross-section approximate circle form (the shape of a doughnut [The whole]) in (c) of drawing 8 . Moreover, in (d) of drawing 8 , since the diameter is reduced as simple pressure-welding member 2202 the very thing has become cross-section triangle-like (the shape of an approximate circle drill [The whole]) and goes at the tip of the ink supply pipe 2200, it was inserted into the gap CL of the common-law marriage of opening 6002, and the external surface of the ink

supply pipe 2200, and the external surface of the simple pressure-welding member 2202 is in contact with the common-law marriage of opening 6002. In (e) of drawing 8, the cross-section [of L characters]-like simple pressure-welding member 2202 is arranged by the peripheral face of the ink supply pipe 2200. This simple pressure-welding member 2202 consists of body 2202c which is prolonged in back from Itabe 2202a which projects in the method of the outside of radial of the ink supply pipe 2200, and this Itabe 2202a and by which inner circumference was fixed to the external surface of the ink supply pipe 2200, and is formed from the ingredient softer than the ingredient with which all constitute the above-mentioned ink cartridge 6000 and a recording head, respectively in degree of hardness. In this example, in case the ink supply pipe 2200 is inserted into opening 6002, while Itabe 2202a of the simple pressure-welding member 2202 deforms, the common-law marriage of opening 6002 is overcome, and the ink supply pipe 2200 engages with opening 6002 by Itabe 2202a. Since this engagement is made according to deformation of Itabe 2202a of the simple pressure-welding member 2202, it can also perform discharge easily. However, at the time of an ink cartridge and recording head association, if an ink cartridge considers the load given to a recording head, the example of drawing 8 (a) - (b) is the optimal.

[0093] Moreover, as other connection structures, not the configuration that prepares a pressure-welding member in the ink jet ink jet head (a) unit IJU side of drawing 8 shown in - (b) but the structure of preparing a pressure-welding member in an ink cartridge 6000 side can be mentioned. That is, the simple pressure-welding member 2202 shown in (a) of previous drawing 8 and the simple pressure-welding member which has the almost same configuration are fixed to the outer wall of an ink cartridge, and the crowning of a projecting part is a configuration which contacts the head fixed wall of the ink jet head unit IJU. Moreover, the simple pressure-welding member itself shown in (b) of drawing 8 may fix the thing of a cross-section round shape to the common-law marriage of opening 6002.

[0094] Furthermore, the structure for which it depended on deformation of the both sides of the above-mentioned ink cartridge 6000 and the ink jet head unit IJU and modification as other connection structures as shown in (a) - (d) of drawing 9 can also be mentioned. In (a) of drawing 9, wall material 6002b is formed in the rim section of opening 6002 with the ingredient softer than the ingredient which constitutes an ink cartridge 6000 and the ink jet head unit IJU, respectively in degree of hardness. It prepares near the opening. Further It has structure which formed the simple pressure-welding member 2202 which consisted of the disk section prolonged to the method of the outside of radial of the ink supply pipe 2200 in the peripheral face of the ink supply pipe 2200, and a body ahead prolonged along the die-length direction of the ink supply pipe 2200 from the outermost edge of this disk section. The front end section of the body of the simple pressure-welding member 2202 is in contact with the outside of wall material 6002b around the opening 6002 of a cartridge 6000 at the time of cartridge wearing. In (b) of drawing 9, wall material 6002b of this example is formed in closing in except for the periphery section of opening 6002 among the configuration walls of the cartridge 6000 near the opening 6002, and has structure which combined the member of simple pressure-welding member 2202 resemblance shown in (a) of previous drawing 9. In (c) of drawing 9, it has structure with which the periphery section of the simple pressure-welding member 2202 which consists of the disk section prolonged from the peripheral face of the ink

supply pipe 2200 at the method of the outside of radial [the] into the notching part which formed only the periphery section of opening 6002 in closing in contrary to the example shown in (b) of previous drawing 9 , and was formed by this is made to engage. In (d) of drawing 9 , a notching part is formed in the central part of medial-surface 6002a of opening 6002 among the configuration walls of a cartridge 6000, and it has structure with which a part of simple pressure-welding member 2202 prepared in this notching part at the peripheral face of the ink supply pipe 2200 is made to engage. That is, the simple pressure-welding member 2202 of this example consists of a body fixed to the peripheral face of the ink supply pipe 2200, and the disk section prolonged in the method of the outside of radial [that] from the periphery central part of this body, and the rim part of the disk section engages with the above-mentioned notching part.

[0095] As mentioned above, it is possible to use the ingredient same as an ingredient which constitutes the simple pressure-welding member as another member and the circumference part of opening as the ingredient which constitutes an ink cartridge 6000 and the ink jet head unit IJU, respectively, but in order to ease the force applied to a recording head at the time of a simple pressure welding, it is desirable to use the ingredient softer than the ingredient which constitutes an ink cartridge 6000 and the ink jet head unit IJU, respectively in degree of hardness.

[0096] As an ingredient which constitutes the simple pressure-welding member as the above-mentioned exception member, in order to control ink evaporation, it is more desirable to choose an ingredient with low gas permeability. Moreover, when making the simple pressure-welding member as another member placed between connection (joint) to an ink cartridge 6000 and the ink jet head unit IJU as mentioned above, the member is attached in any [of an ink cartridge 6000 or the ink jet head unit IJU] side at arbitration at the time of an initial state, i.e., connection, and after the configuration and a dimension also take into consideration the configurations of an ink cartridge 6000 and the ink jet head unit IJU, a dimension, etc., it is decided to be arbitration. Furthermore, when attaching the simple pressure-welding member as another member in the ink supply pipe 2200 of the ink jet head unit IJU, it is not necessary to fix and the one freer rather movable is desirable.

[0097] The configuration shown in drawing 5 mentioned above is one of the optimal things of the ink tank used for this invention. Namely, it is because it has the opening between opening 6002 and a supply pipe 2200, and this stops easily being able to give force which affects the location precision of a recording head at the time of ink tank insertion. Even if it prepares the simple pressure-welding member shown in drawing 8 and drawing 9 to this configuration, above-mentioned effectiveness will not be spoiled but the problem of ink evaporation or ink leakage will be solved.

[0098] Drawing 10 is the perspective view showing the appearance of the more desirable example of the ink jet head unit of this invention. In this example, the pressure-welding member 2202 of the ink jet head unit IJU is formed in the base of four ink supply pipes 2200 and one which were arranged by one side attachment wall of Unit IJU at the single tier. As each ink supply pipe 2200 was mentioned above, the shape of a trumpet to which the path by the side of a base was narrowed down is made from the point, and further, when the ink supply pipe 2200 as the joint section is pushed in in the opening 6002 of the ink tank 6000 as an exchange mold ink cartridge, the adhesion encapsulant 2203 for closing opening 6002 and carrying out connection immobilization of the ink tank 6000

and the unit IJU is arranged on the narrowing-down part. The crevice 2204 and heights 2205 for positioning of immobilization in the case with the ink tank 6000 are formed in Unit IJU top Norikazu side attachment wall. Although the positioning crevice for running at the positioning heights HC 1 of the head carriage HC, and positioning is formed in the wall of the opposite side of one side attachment wall, it does not illustrate to drawing 10 but illustrates to drawing 11 .

[0099] Drawing 11 is the fragmentary sectional view showing the important section of the recording device which equipped with the ink jet head unit IJU shown in drawing 10 on the head carriage HC. In drawing 11 , the positioning crevice 2400 is made to contact the positioning heights HC 1 of the head carriage HC, positioning immobilization is carried out, and it is equipped with an ink cartridge 6000 to this unit IJU, and the ink jet head unit IJU is laid on the head carriage HC. If the structure of a part where the ink tank 6000 is laid among the head carriage HC is explained in full detail, it consists of lobes HC 3 which project in the drawing upper part at the edge of the loading section HC 2 which has a flat side mostly, and this loading section HC 2. The slope HC 4 which falls on the right-hand side of a drawing is formed in the upper part of this lobe HC 3. Moreover, a lobe HC 3 is a member for pressing so that the ink tank 6000 may connect firmly the wall which has the opening 6002 of the ink tank 6000 explained in full detail behind, and the wall of the opposite side by Unit IJU. In case the head carriage HC is equipped with the ink tank 6000, after inserting the ink supply pipe 2200 of Unit IJU into the opening 6002 of the ink tank 6000, the ink tank 6000 is pushed to the fixed unit IJU, and the ink tank 6000 is depressed, letting the slope HC 4 of the head carriage HC slide for the lower corner of the ink tank 6000. Thereby, while the ink tank 6000 is certainly fixable, opening 6002 can also be sealed certainly.

[0100] In addition, although the level difference was prepared between the ink supply pipe 2200 and the pressure-welding member 2202, and spreading of the adhesion encapsulant 2203 was closed in this example if as shown in drawing 11 , what may not have a level difference depending on the method of application is not explaining.

[0101] Next, by using for the configuration of this invention described so far explains below the desirable modification of the structure of an ink tank where effectiveness is acquired in multiplication, including the operation explanation also common to the ink tank of a configuration of having mentioned above.

[0102] First, the configuration between which it is placed between an ink tank and an ink jet head as a joint device of an ink jet head and an ink cartridge by the sealing member 2202 as a pressure-welding member of drawing 11 was offered. It is desirable to prevent a liquid outflow certainly to the exterior, where the deformable sealing member 2202 is deformed here. Moreover, like the ingredient mentioned above, when the supply pipe of a head is inserted into an ink tank and the space section is formed in the interior of the ink tank near the opening, when pressurized rather than atmospheric air, what shows some permeability is good. When the pressure inside a tank rises by the environmental variation, this carries out pressure relaxation of the inclination which the pressurized ink concentrates to the atmospheric-air free passage section side of a tank by some permeability, and is considered to be because for the migration by the side of the supply pipe of ink to be promoted.

[0103] moreover, the side which counters the above-mentioned tank configuration and the bridgewall which forms the above-mentioned minute free passage section especially -

- opening for ink supply -- or By considering as the configuration in which the compression (or compression is possible) field of the negative pressure generating object by the supply pipe is made to exist As a configuration this [whose] the ink of the 2nd receipt room secures the substantial ink supply way stabilized in the negative pressure generating inside of the body, and stabilizes more For the configuration located about the inferior surface of tongue of an ink cartridge more nearly up than the above-mentioned minute free passage section, the above-mentioned opening for ink supply the permeability of the some of the sealing member 2202 Since it becomes the usual gas transparency inhibition operation, the conditions of gas liquid exchange of the 2nd receipt room of substantial sealing structure can be made into what was stabilized further, and it is thought that the ink supply nature of the absorber compression field of a supply pipe is securable. From this viewpoint, the permeability of the some of the above-mentioned sealing member 2202 is good also as a perfect gas closure ingredient.

[0104] In addition, the device which engages with the valve structure to which insertion tubing peculiar to an ink jet with which the "supply pipe" as used in the field of this invention is inserted in a porosity member is attached to a cartridge from the first, and the compression set of the negative pressure generating object is carried out, or a connection member is also included.

[0105] Furthermore, although the ink migration by the environmental dependence and internal configuration of ink became remarkable when the conditions of the ink used were examined, and ink surface tension exceeded cm in 55 dynes (25 degrees C) /, this problem was no longer expected in criticality to be 55 dynes/cm or less, and the property stabilized extremely was shown, without it being influenced by the environment that they are especially 50 or less dyne/cm. On the other hand, the progressive certainly stabilized in the negative pressure generating member as it is 55 dynes/cm or less was shown, and when it was the configuration that the gas-liquid interface of the air which is a gas, and the ink which is a liquid is formed into a negative pressure generating member, the effectiveness as for which the interface is especially made to what was stabilized over the long period of time was accepted. In the cartridge which has the vapor-liquid exchange promotion structure which extends from the above-mentioned minute free passage section to the above-mentioned negative pressure generating member opposite location of the 1st receipt interior of a room of the above, since this functioned as the configuration in multiplication and formed the linear interface in the condition of having been stabilized, it was a desirable thing thing. On the contrary, when the ink surface tension for a premise configuration was less than 20 dyne/cm (25 degrees C), even if there was such an impact that an ink leakage phenomenon was seen and they were 20 or more dyne/cm when an impact was added although ink leakage did not arise, by use, it usually became clear that ink leakage was prevented according to the synergistic effect of the advantage of a premise configuration and an ink property. Moreover, 50 or less dyne/cm 25 dynes [/cm] or more showed especially the property stabilized extremely, without being influenced by the environment.

[0106] Explanation centering on the more desirable configuration of the negative pressure generating room hereafter established in the ink cartridge in the configuration of this invention shown in said drawing 4 thru/or drawing 11 is given.

[0107] Ink is not given but the negative pressure generating member 23 near [which is allotted to the negative pressure generating member hold room 24 as shown in drawing

12] the atmospheric-air free passage section is made to exist here as a field which does not hold ink. Then, the seal of the opening 13 is carried out with a ball 14, and the seal of opening 22 and the atmospheric-air free passage section is carried out by the same seal member S (you may differ). Drawing 12 shows the ink cartridge before use. Ink shall be filled up with this drawing in the ink receipt room 26. Drawing 12 shows the schematic diagram of the printer which uses this while showing the ink cartridge 21 of this sealing condition. Negative pressure generating object field 23A located in this ink cartridge 21 near the atmospheric-air free passage section 20 is prepared in the cartridge upper part corner as a field which does not hold ink. Negative pressure generating object field 23B located under this field 23A is a compressible field as for which a compression set is carried out by insertion of an ink supply pipe (un-illustrating). Negative pressure generating objects other than these field 23A and 23B hold the ink with which there is no external effect of others and it filled up. Of course, field 23B is a field which counters the opening 22 for ink supply pipe wearing prepared in the same field in the lower part of the atmospheric-air free passage section 20. Moreover, opening 22 is located more nearly up than the minute free passage section 28, and has each of the description configuration mentioned above all.

[0108] Although the cartridge 21 of drawing 12 is removing the seal member S mentioned above and becomes usable, since the above-mentioned field 23A does not hold ink, ink is not leaked even if the vibration and pressure variation at the time of seal removal occur.

[0109] This example is making this field near the atmospheric-air free passage section of a negative pressure generating member into the field which does not hold ink as a technical viewpoint which is not concerned with the state of preservation or busy condition of an ink cartridge, but sweeps away a Prior-art level, and can prevent that the ink in an ink cartridge leaks from the atmospheric-air free passage section to fluctuation of an environmental condition. There is the peeling prevention effectiveness of a seal member to the case where the seal member has sealed the atmospheric-air free passage section especially. Moreover, if it is in a busy condition, an amount as occasion demands can supply this field efficiently in a cartridge, and atmospheric air has the effectiveness which controls the negative pressure change in an ink jet cartridge. Since the osmosis rate of ink itself can be decelerated more as it gets wet and is what is not **, it is desirable, but this field near the atmospheric-air free passage section is good also as a field which removed that ink, after [which is completely depended on ink] soaking beforehand in ink.

[0110] moreover, the side which counters the bridgewall with which this example forms the above-mentioned minute free passage section -- opening for ink supply -- or By considering as the configuration in which the compression (or compression is possible) field of the negative pressure generating object by the supply pipe is made to exist As a configuration this [whose] the ink of the ink receipt room 26 can secure the substantial ink supply way stabilized in the negative pressure generating inside of the body of the negative pressure generating member hold room 24, and stabilizes more It can mention that the above-mentioned opening for ink supply makes it located about the inferior surface of tongue of an ink cartridge more nearly up than the above-mentioned minute free passage section. An operation arrangement-related [this] can carry out [fixed]-izing of the substantial ink migration direction, all the ink of the ink receipt room 26 can

consume it, after this consumption is intervening so that it may move to the opening side which the air in the ink receipt room 26 counters, consumption of the ink of the negative pressure generating inside of the body is enabled as a result, and it is for the ability decreasing about residual ink.

[0111] The ink supply way of one direction mentioned above can form in the field which is not compressed, the same effectiveness is acquired, and an ink residue can decrease further according to the ink secured capacity of a compression field by having the field which is not compressed by the supply pipe of a negative-pressure generating object toward the side which counters this wall from the bridgewall which forms the above-mentioned minute free passage section especially, and the field which are compressed by the supply pipe of a negative-pressure generating object in this order.

[0112] The ink jet printer of this example has a head recovery means HR to perform ink discharge out of a cartridge by suction or the regurgitation by the suction means through a head automatically or in hand control, according to having equipped with the above-mentioned cartridge 21, as shown in drawing 12. Since it is correctable by this before printing the ink condition of the negative pressure generating inside of the body, the above-mentioned function of cartridge original can be used without being influenced by the neglect condition of a cartridge.

[0113] The tank 21 with which it is equipped to the ink jet head HD held at the scanning carriage CR by drawing 12 removes the seal tape S explained previously. The ink supply pipe of a head passes along the above-mentioned opening 22, and the tank 21 with which it was equipped on carriage carries out the compression set of the compressible field 23B of the negative pressure generating member 23. The negative pressure generating member 23 is made to deform into the minute free passage section 28 side in this example. At this time, the wearing signal LP is inputted into the printer control means CC by the attachment-and-detachment detection means (since it was substituted by the mechanical or electric well-known detection means, it presupposed un-illustrating) of a tank. According to this, before a recording start, the head recovery means HR operates, the ink in a tank 21 is discharged, and the condition of the ink in a tank is improved.

[0114] Drawing 13 (A) and (B) show the possible condition inclination range of the print of this invention example, or an ink supply condition, respectively, and 40 in drawing shows the horizontal plane. The more desirable condition for this invention is that the minute free passage section is located in a lower part side, and is good to become parallel to a horizontal plane 40 on the cartridge inferior surface of tongue ideally. However, in a two-room configuration, the include angle theta which the horizontal plane like drawing of (A) and (B) and an ink cartridge base make does not have un-arranging on use to the range of $0 \leq \theta \leq 15$ degrees like this example practically, respectively. When making it lay and move onto scanning carriage, the range of $0 \leq \theta \leq 5$ times is desirable.

[0115] Moreover, even if the case where the cartridge inclined and was prepared in this way was caused by a certain unexpected factor, as mentioned above, since the opening 6002 of the ink supply pipe 2200 and an ink cartridge has the composition which has a gap, i.e., a free joint configuration, it can make the load concerning a recording head small, and does not affect an installation condition. Therefore, the ink supply engine performance is maintained by fitness while it had been stabilized.

[0116] Although two or more member configurations are sufficient as the negative pressure generating member of the example of this invention mentioned above, since

atmospheric migration arises there and it may be easy to produce un-arranging if mutual Hazama's interface (interface between members) arises, it is good that it is a desirable porosity room object with a single negative pressure generating member.

[0117] Moreover, an ink hold room can also be included as ** which contains ink substantially, if ink is relatively included so much rather than a negative pressure generating member receipt room.

[0118] Next, the ink consumption gestalt in an ink cartridge is explained using drawing 14.

[0119] Drawing 14 (a) is the type section Fig. showing the condition that inserted in the opening 22 of the ink cartridge body 21 of an example the joint member 27 which is the ink supply pipe which supplies ink to an ink jet recording head, carried out the pressure welding to the negative pressure generating member 23, and operation of an ink jet recording device was attained. In addition, it is desirable to install the filter, in order to eliminate the dust in an ink cartridge to edge opening of the joint member 27. If an ink jet recording apparatus works, ink will be breathed out from the orifice of an ink jet recording head, and an ink suction force will occur on an ink tank. Ink 29 is drawn by this suction force in the joint member 27 through the negative pressure generating member hold section 24 and the negative pressure generating member 23 through the clearance section 28 of the edge of a rib 25, and the ink cartridge pars basilaris ossis occipitalis 11 from the ink hold section 26, and is supplied to an ink jet recording head. Thereby, except clearance section 28, the pressure inside the sealed ink hold section 26 declines, and differential pressure is produced between the ink hold section 26 and the negative pressure generating member hold section 24. If record continues, the differential pressure will continue a rise, but since the negative pressure generating member hold section 24 is wide opened by atmospheric air with the atmospheric-air free passage hole 20, as shown in drawing 14 (b), air goes into the ink hold section 26 through the negative pressure generating member 23 from the clearance section 28 of a rib 25 and the ink cartridge pars basilaris ossis occipitalis 11. At this time, the differential pressure of Hazama of the ink hold section 26 and the negative pressure generating member hold section 24 is canceled. During ink jet record, this actuation is repeated and a certain fixed negative pressure is obtained in an ink cartridge. Moreover, except the ink adhering to the wall surface in the ink hold section 26, since the ink in the ink hold section 26 can be used mostly altogether, its ink utilization ratio improves (drawing 14 (c)). At the time of un-recording, the capillary tube force (or meniscus force in an ink-negative pressure generating member interface) of negative pressure generating member 23 self etc. is demonstrated, and it controls that ink leaks from an ink jet recording head.

[0120] Drawing 15 (A) is a sectional view in which drawing of longitudinal section of the ink cartridge body for ink jets of other examples of this invention and drawing 15 (B) show this cross-sectional view, and drawing 16 shows the front face of a rib. The atmospheric-air installation slot 1031 and the negative pressure generating member control room 1032 are formed in some ribs 1005 which are the septa of the ink hold section 1006 and the negative pressure generating member hold section 1004 at the ink cartridge body 21001 for ink jets. The atmospheric-air installation slot 1031 is formed in the negative pressure generating member hold section 1004 side from the interstitial segment of a rib 1005 to the edge 1008 of a rib 1005, i.e., the gap section with the ink cartridge pars basilaris ossis occipitalis 1011. And between the negative pressure

generating members 1003 which touch near the atmospheric-air installation slot 1031 of a rib 1005, the negative pressure generating member control room 1032 of a configuration which was scooped out is formed.

[0121] From the negative pressure generating member 1003 being contacted by the inside of the negative pressure generating member hold section 1004, though the negative pressure generating member 1003 was inserted in the ununiformity, for example, as shown in drawing 15 (B), the contact (compression) force of the negative pressure generating member 1003 will be eased partially. For this reason, if it begins to consume ink from a head, the ink in which it sinks into the negative pressure generating member 1003 will be consumed, and it will reach to the negative pressure generating member control room 1032. If ink continues consuming also after that, atmospheric air will tend to tear an ink meniscus from the part in which the contact force of the negative pressure generating member 1003 is eased by the negative pressure generating member control room 1032, and it will have become, and atmospheric air is promptly introduced into the atmospheric-air installation slot 1031, and control of negative pressure becomes easy.

[0122] It is named generically vapor-liquid exchange promotion structure including other configurations which have a function equivalent to the above ribs, a negative pressure generating member control room, or these. In the ink cartridge which has this vapor-liquid exchange promotion structure, at least liquid ink can obtain the optimal field by adjusting the height of the crowning of the vapor-liquid exchange promotion structure arranged in the 1st hold room side-attachment-wall side of the free passage section upper part of the 1st receipt room which is a negative pressure generating member hold room, and the 2nd receipt room which is the ink hold section.

[0123] Although there is the approach of changing the compression direction of a negative pressure generating member and compressibility as at least liquid ink was mentioned above as a means to control the optimal field, the purpose can be attained with repeatability more certainly [the adjustment of the top location of vapor-liquid exchange promotion structure], and sufficient. Of course, at least liquid ink may be made into the above-mentioned optimal field by combining these approaches.

[0124] Next, the example is shown.

[0125] It became possible to carry out vapor-liquid exchange of the ink and atmospheric air in the ink hold section at this invention whether you are stability and Sumiya at the time of ink supply, as explained above, consequently it became possible to be stabilized and to control the internal pressure in an ink feed zone, and, moreover, high-speed printing was attained [that the regurgitation stability in a recording head is good, and]. Moreover, it became possible to offer the ink tank to change of an external environment which ink leakage does not generate to the pressure variation in an ink tank.

[0126] Next, the physical properties for which the ink preferably used to the ink tank of each example mentioned above is asked are explained. The ink interface in a negative pressure generating member is stable also to vibration of an ink tank, and desirable ink shows behavior with a stable gas-liquid interface to an environmental variation, and its things are desirable. Therefore, the surface tension of ink has good 20 dyne/cm - 55 dyne/cm, and they are 25 dynes/cm - 50 dyne/cm more preferably. When the surface tension of ink is in this range, the phenomenon in which the meniscus of the head orifice section is torn, consequently ink overflows from the head orifice section at the time of un-printing is not produced.

[0127] As surface tension of 20-30 degrees C of a water-soluble typical organic solvent, ethanol (22 dyne/cm), Isopropanol (22 dyne/cm), a cyclohexanol (34 dyne/cm), A glycerol (63 dyne/cm), a diethylene glycol (49 dynes/(cm)), Although there are the diethylene-glycol monomethyl ether (35 dynes/(cm)), triethylene glycol (35 dynes/(cm)), a 2-pyrrolidone (47 dynes/(cm)), and an N-methyl pyrrolidone (41 dynes/(cm)) These solvents and water are mixed and desired surface tension is obtained.

[0128] How to control the surface tension of ink using a surfactant is explained. For example, in sorbitan mono-lauric-acid ester, 28 dyne/cm is obtained by 1% of addition to water, and 35 dyne/cm is obtained to water at 1% of addition with polyoxyethylene sorbitan mono-lauric-acid ester. Moreover, at ASECHIRE Norian EH (EO addition product of an acetylene glycol), 28 dyne/cm is obtained by 1% or more of addition. When low surface tension is still more nearly required, 17 dyne/cm is obtained at 0.1% to water with the fluorine system surfactant S-145 (perphloro alkyl EO addition product by the Asahi glass company), for example, Sir chlorofluocarbon. Since surface tension merely changes with other additives of *Perilla frutescens* (L.) Britton var. *crispa* (Thunb.) Decne. somewhat, it adjusts suitably.

[0129] Drawing 17 is the appearance perspective view of the ink jet recording device IJRA which can carry the recording head unit shown in each above-mentioned example.

[0130] In drawing 17, the forward inverse rotation of a drive motor 5013 is transmitted to a leading screw 5004 through the driving force transfer gears 5011 and 5009, and this is rotated, and Carriage HC has the pin (un-illustrating) which engages with ***** 5005 of a leading screw 5004. Both-way migration of the carriage HC is carried out by this at an equipment longitudinal direction. 5002 is a cap which caps the front face of each recording head in a recording head unit, and it is used in order for a suction means by which it does not illustrate to perform suction recovery of a recording head through opening in a cap. Cap 5002 can cover the delivery side of migration each recording head with the driving force transmitted through gear 5008 grade. 5017 is a cleaning blade, 5019 is a member which makes this blade movable at a cross direction, and these are supported by the body support plate 5018. It cannot be overemphasized that a blade is not restricted to this gestalt but a well-known cleaning blade can apply to this example.

[0131] When carriage moves to a home position, it is constituted so that a request can be processed according to an operation of a leading screw 5005 in those correspondence locations, but if it is made to operate to well-known timing about a request, each can apply these capping, cleaning, and suction recovery to this example.

[0132] The connection pad 4502 of a recording head unit with which Carriage HC was equipped is connected with the connection pad 5031 when the connection plate 5030 formed in Carriage HC rotates to the circumference of a predetermined shaft, and electrical installation is made. In order that this connection may not use a connector etc., the unnecessary force does not act on a recording head.

[0133] (in addition to this) In addition, especially this invention is equipped with means (for example, an electric thermal-conversion object, a laser beam, etc.) to generate heat energy as energy used also in an ink jet recording method in order to make the ink regurgitation perform, and brings about the effectiveness which was excellent in the recording head of the method which makes the change of state of ink occur with said heat energy, and the recording device. It is because the densification of record and highly minute-ization can be attained according to this method.

[0134] About the typical configuration and typical principle, what is performed using the fundamental principle currently indicated by the U.S. Pat. No. 4723129 specification and the 4740796 specification, for example is desirable. Although this method is applicable to both the so-called mold on demand and a continuous system On the electric thermal-conversion object which is especially arranged corresponding to the sheet and liquid route where the liquid (ink) is held in the case of the mold on demand By impressing at least one driving signal which gives the rapid temperature rise which supports recording information and exceeds nucleate boiling Since make an electric thermal-conversion object generate heat energy, the heat operating surface of a recording head is made to produce film boiling and the air bubbles in the liquid (ink) corresponding to this driving signal can be formed by one to one as a result, it is effective. A liquid (ink) is made to breathe out through opening for regurgitation by growth of these air bubbles, and contraction, and at least one drop is formed. If this driving signal is made into the shape of a pulse form, since growth contraction of air bubbles will be performed appropriately instantly, the regurgitation of a liquid (ink) excellent in especially responsibility can be attained, and it is more desirable. As a driving signal of the shape of this pulse form, what is indicated by the U.S. Pat. No. 4463359 specification and the 4345262 specification is suitable. In addition, if the conditions indicated by the U.S. Pat. No. 4313124 specification of invention about the rate of a temperature rise of the above-mentioned heat operating surface are adopted, further excellent record can be performed.

[0135] As a configuration of a recording head, the configuration using the U.S. Pat. No. 4558333 specification and U.S. Pat. No. 4459600 specification which indicate the configuration arranged to the field to which the heat operation section other than the combination configuration (a straight-line-like liquid flow channel or right-angle liquid flow channel) of a delivery which is indicated by each above-mentioned specification, a liquid route, and an electric thermal-conversion object is crooked is also included in this invention. In addition, the effectiveness of this invention is effective also as a configuration based on JP,59-138461,A which indicates the configuration whose puncturing which absorbs the pressure wave of JP,59-123670,A which indicates the configuration which uses a common slit as the discharge part of an electric thermal-conversion object to two or more electric thermal-conversion objects, or heat energy is made to correspond to a discharge part. Namely, no matter the gestalt of a recording head may be what thing, it is because it can record now efficiently certainly according to this invention.

[0136] Furthermore, this invention is effectively applicable also to the recording head of the full line type which has the die length corresponding to the maximum width of the record medium which can record a recording device. As such a recording head, any of the configuration which fills the die length with the combination of two or more recording heads, and the configuration as one recording head formed in one are sufficient.

[0137] Moreover, as a configuration of the recording device of this invention, since the effectiveness of this invention can be stabilized further, it is desirable to add the regurgitation recovery means of a recording head, a preliminary auxiliary means, etc. If these are mentioned concretely, a preheating means to heat using the capping means, the cleaning means, the pressurization or the suction means, the electric thermal-conversion object, the heating elements different from this, or such combination over a recording head, and an auxiliary discharge appearance means to perform the regurgitation different

from record can be mentioned.

[0138] Moreover, although only one piece was prepared also about the class thru/or the number of a recording head carried, for example corresponding to monochromatic ink, corresponding to two or more ink which differs in an others and record color or concentration, more than one may be prepared the number of pieces. That is, although not only the recording mode of only mainstream colors, such as black, but a recording head may be constituted in one as a recording mode of a recording device or the paddle gap by two or more combination is sufficient, for example, this invention is very effective also in equipment equipped with at least one of each of the full color recording mode by the double color color of a different color, or color mixture.

[0139] In this invention, the most effective thing performs the film-boiling method mentioned above to each ink mentioned above.

[0140] Furthermore, in addition, as a gestalt of this invention ink jet recording device, although used as an image printing terminal of information management systems, such as a computer, the gestalt of the reproducing unit combined with others, a reader, etc. and the facsimile apparatus which has a transceiver function further may be taken.

[0141]

[Effect of the Invention] It is possible to detach and attach an INKKU cartridge, without having precision-effect on the configuration of the exchange mold ink cartridge of this invention, then the attaching position of an ink jet head, and reducing a quality of printed character to them, as explained above. That is, it can equip with an ink cartridge at the time of association of an ink cartridge and an ink jet head, without applying the external force from an unprepared direction to an ink jet head.

[0142] And also at the time of the independent PD, the exchange mold ink cartridge of this invention maintains high dependability, and turns into a high exchange mold ink cartridge of the ink utilization ratio in which residue detection of ink is possible with simple structure.

[0143] Moreover, moderate negative pressure is maintained from the early stages of use to use termination at the time of record and un-recording, and it corresponds to high-speed record, and becomes the exchange mold ink cartridge which does not have an ink leak in the operating environment conditions of an ink jet recording apparatus.

[0144] Furthermore, the handling nature of an exchange mold ink cartridge serves as an exchange mold ink cartridge which is good, does not have an ink leak etc. at the time of the desorption to an ink jet recording apparatus, and does not have wearing malfunction to an ink jet recording apparatus.

[0145] According to this invention, even if ink becomes tank internal pressure should rise in the worst environment, and extruded by carrying out adhesion closure of the outer wall and pressure-welding member of the joint section of a record means, ink cannot leak out and a reliable ink jet head unit can be offered.

TECHNICAL FIELD

[Industrial Application] This invention is usable to the textile-printing device which prints an image etc. on record devices, such as a copying machine which uses an ink jet technique, and facsimile, communication equipment, cloth, etc. about an ink jet unit and ink jet equipment equipped with the ink container which stores the ink supplied to an ink jet head, and this ink container.

PRIOR ART

[Background of the Invention] In various devices, such as a printer, facsimile, and a reproducing unit, an ink jet recording device is being widely used as a means which records on recorded media, such as paper and cloth.

[0003] It is made to build in device cases, such as the various electronic equipment which created and inputs the example which the ink jet recording device has composition which carries out the regurgitation of the ink to the recorded media concerned from the recording head which countered recorded media, dedicates in the device case which became independent as an ink jet recording device, and has been considered as the simple substance configuration, and recording information, for example, a word processor, and a personal computer, and there are electronic equipment and a really constituted example.

[0004] While being able to supply the ink corresponding to the amount of ink generally breathed out from a recording head at the time of record good to the configuration of the ink hold section currently used for these ink jet recording devices, it is required that there are no un-arranging from a delivery, such as ink leakage, at the time of un-recording. Usually, the configuration of the ink hold section adopts cartridge form, and is made exchangeable.

[0005] Moreover, the ink hold section for ink jets may be united with an ink jet head in order to realize the miniaturization of a recording apparatus. In this case, if it stops being able to carry out the regurgitation of the ink of ink hold circles from an ink jet head, it will be discarded with a head. However, ink remained in the ink hold section, and even if the amount of the ink which remains in these ink hold circles added amelioration, it was governed by the ink maintenance capacity of the sponge which is the negative pressure generating object of ink hold circles mostly contained by the whole for the above-mentioned ink leakage prevention, and became [many / comparatively]. Furthermore, before the engine performance of the recording head itself fell, it will be exchanged with the ink hold section and the recording head had had serious effect to a cost rise and cost performance of a product.

[0006] As a cure to the above-mentioned cost rise etc., the gestalt which unifies a recording head and an ink cartridge removable is adopted, and the configuration which enabled exchange of only an ink cartridge is mentioned. In this case, desorption of an ink cartridge can be smoothly performed by Hazama with a recording head, there is no ink leakage in the case of that desorption etc., and a load is required to supply ink to a recording head certainly at the time of wearing.

[0007] It is indicated by JP,63-87242,A as a gestalt of the ink hold section of the recording head used for the conventional ink jet recording device, and one. This is the ink jet unit equipped with two or more ink injection orifices by which foam was arranged in ink hold circles. In this ink hold section, in order to store ink in porous media like the polyurethane foam which is foam, generating of the negative pressure by the capillary tube force of porous media and maintenance of ink, i.e., the ink leakage prevention from the ink hold section, are attained.

[0008] However, since [of ink hold circles] porous media were mostly needed for the whole, while the fill of ink was restricted, there were many amounts of ink which remain without being used into porous media, and there was a problem that the utilization ratio of ink was bad. Moreover, since it was filled up with ink into porous media, the technical problem that residue detection of ink was difficult and it was still more difficult to keep the negative pressure of ink hold circles almost constant during an ink consumption period occurred.

[0009] The technique which added amelioration that this technical problem should be solved is indicated by JP,2-522,A. The ink jet record cartridge which connected between a primary ink stores dept., a secondary ink stores dept., and ink jet recording heads with this official report by the porosity member is indicated. In such a cartridge, improvement in the utilization ratio of ink is enabled by having arranged the porosity member only all over ink passage, without an ink stores dept. building. Moreover, since the outflow ink from the primary ink stores dept. which originated in air expansion of the primary ink stores dept. accompanying the pressure drop by the temperature rise by preparing a secondary ink stores dept. can be collected, the negative pressure to the recording head at the time of record is uniformly maintainable on parenchyma.

[0010] However, since the negative pressure generating member had been arranged all over ink passage, the porous media as a negative pressure generating member had sunk in ink enough, it became inadequate in the time of un-recording generating [of the negative pressure by the capillary tube force of porous media] them, and there was a problem that ink leaked from the orifice of an ink jet recording head by few impacts. Moreover, since the above-mentioned ink jet recording head is beforehand formed in the ink hold section and one, in the case of the exchange mold ink cartridge which equips an ink jet recording head with an ink cartridge which was mentioned above, the technical problem were inapplicable occurred.

[0011] Moreover, an ink jet unit is constituted using an ink jet head and an ink cartridge as removable, and in preparing in the carriage formed in the recording apparatus, the ink leakage at the time of exchange of only an ink cartridge poses a problem. Unlike the case where an ink cartridge is prepared in the location estranged from the recording head, the ink leakage in this case pollutes the inside of a recording device, and has a possibility of causing the faulty connection in the electric contact surface of a recording head and a body, dirt of recorded media, etc. Since the configuration which allots a recording head and an ink cartridge is used for this problem on carriage in recent years for the miniaturization of equipment, it is a serious technical technical problem.

[0012] And in order to pass a recording head and an ink cartridge, it is necessary to supply much ink for a short time, and what has a thick ink supply pipe is demanded again with the configuration which forms an ink supply pipe in a recording head for making quick the recording rate of an ink jet recording device etc. Therefore, when a pressure

welding was carried out to the absorber which exchanges ink cartridges, inserts an ink supply pipe, and holds ink, the ink which the absorber was pressed and compressed and was absorbing it by the point of an ink supply pipe might soil a leakage recording device or recorded media to the exterior of exudation and an ink cartridge.

[0013] Furthermore, since it was required that ink cartridge desorption should also have been easy as mentioned above, it was difficult to satisfy these all.

[0014] And since the installation location is strictly set up in order to always keep discharging performance high, the recording head mentioned above must prevent that the location shifts by external force vibration etc. From this viewpoint, there was the need of making it not push a recording head by the ink cartridge carelessly at the time of the desorption of an ink cartridge. Although adopting the configuration which an ink cartridge does not give a load at the time of the desorption of a recording head and an ink cartridge etc. is mentioned only in a certain specific direction as this cure, various kinds of direction specification-part material must be prepared in this case, and plurality-izing and enlargement of equipment will be caused.

EFFECT OF THE INVENTION

[Effectiveness by the joint free-lancer]

(1) Tank exchange can be performed smoothly.

[0077] (2) A register adjusted head with the low load to a head does not shift.

[0078] (3) The yield of components becomes high rough [the precision of joint opening of a tank, and the head joint section], and well, and cost can be fallen.

[0079] (4) The components yield can increase rough [the ink tank loading section guide precision of body carriage], and well, and cost can be reduced.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] This invention aims at making small the load which an ink container covers to a recording head at the time of the attachment and detachment further for the purpose of attachment and detachment of a recording head and an ink container offering an easy exchange mold ink jet unit.

[0016] Furthermore, this invention aims at offering the ink jet unit which can maintain the engine performance for a long period of time where said ink jet unit is carried to the ink jet recording apparatus.

[0017] Moreover, it is also making into the purpose to offer the configuration which can prevent the ink leakage from an ink container irrespective of a use gestalt.

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, in the exchange mold ink cartridge which has the hold section which this invention has opening for connecting with the joint section as ink feed zone material prepared in the ink jet head, and held the negative pressure generating member, said opening proposes the configuration which has gap where the wall is sufficient between the outer walls of the joint section of said ink jet recording head.

[0019] the joint with which opening of an ink cartridge does not contact the joint section of an ink jet head by using the above-mentioned configuration -- since it is free, the ink cartridge which the external force except the force which pushes in the negative pressure generating member in an ink cartridge does not join an ink jet head, and can offer always good printing, an ink jet unit, and ink jet equipment can be offered.

[0020] And when combining an ink jet head and an ink cartridge, the configuration which prepares in one of an ink jet head and the ink cartridges also proposes the gap formed between said joint sections and openings for a wrap pressure-welding member.

OPERATION

[Function] Since opening of an ink cartridge considered as the joint free-lancer who does not contact the joint section of an ink jet head according to this invention, the external force except the force which pushes in the negative pressure generating member in an ink cartridge cannot be applied to an ink jet head, and always good printing can be guaranteed.

EXAMPLE

[Example] Hereafter, the example of this invention is explained to a detail with reference to a drawing.

[0023] Drawing 1 is the outline sectional view showing the important section of the ink jet head (henceforth a recording head) used in the one example of this invention.

[0024] As shown in drawing 1, a recording head consists of a substrate 100 (a heater board is called below) which prepared the heat energy generating component, and a substrate 1300 with the concave heights which constitute the liquid room 7 and the ink way 8 in which it is joined to this substrate 100 and a record liquid (ink is called below) is held. This substrate (henceforth a fluting top plate) 1300 is equipped with the orifice plate 400 in which the ink delivery (henceforth an orifice) 9 for carrying out the regurgitation of the ink which was open for free passage on the ink way 8 was established in one.

[0025] Adhesion immobilization of the heater board 100 is carried out by adhesives at the support substrate (henceforth a base material) 300, and the orifice plate 400 with which temporary adhesion is carried out and a fluting top plate equips the heater board 100 so

that the heat-energy generating component 1 arranged on the heater board 100 as the fluting top plate 1300 is shown at drawing 1 may be contained in the ink way 8 constituted by this junction is arranged like front sagging in the front-end side of the support substrate 300.

[0026] And sticking-by-pressure immobilization of the heater board 100 and the fluting top plate 1300 is further carried out with the presser-foot spring 500. In addition, the presser-foot spring 500 engages with a substrate 300, and has the heater board 100 and composition which pinches the fluting top plate 1300.

[0027] Ink is supplied from the ink supply route part material 600 through the ink feed hopper 1500 prepared in the upper part of the fluting top plate 1300. The ink supply route part material 600 has a projection rod, and is fixed to the support substrate 300 by inserting this projection rod in the through hole prepared on the support substrate 300, and carrying out a heat caulking to it.

[0028] Drawing 2 and drawing 3 show one example of this invention, respectively, it is the decomposition perspective view of the recording head unit equipped with two or more recording heads 2000 which have the structure of drawing 1, and illustration of the housing member of the above-mentioned unit is omitted in drawing 2.

[0029] The recording head unit of this example can equip with four recording heads in which the regurgitation [the ink of a color different, respectively] is possible, and can define the physical relationship between these recording heads correctly. In addition, gradation record is attained even if it is made to carry out the regurgitation of the ink in which the four above-mentioned recording heads may breathe out the ink of the same color, and high-speed record or the gradation expression of them according to the number of ink droplets is attained in this case, and concentration differs in the same color, respectively.

[0030] In drawing 2, a reference mark 4000 shows the ink jet head unit frame which has two or more ink jet heads. The unit frame 4000 is equipped with the horseshoe-shaped outer wall plate 4001 and three wall plates 4002 which carry out the limitation of the head attaching part 4003 for containing each recording head. The recording head 2000 explained by drawing 1 is contained by each head attaching part 4003 where the ink delivery is turned to the method of drawing Nakashita. Positioning of each recording head in the unit frame 4000 dashes the datum level established in the datum level of three directions established in each head attaching part at each recording head, and is fixed by adhesives etc. after that. In this case, in each recording head 2000, the physical relationship of that datum level and orifice needs to be set up with high precision.

[0031] In addition, it positions on the image by not the method of using above-mentioned datum level but a TV camera etc., and you may make it fix by adhesion after that about positioning of each recording head 2000.

[0032] Thus, since according to this example adhesion immobilization of the four recording heads is carried out at a unit frame, an ink jet head unit is constituted and it is made to perform exchange of a recording head for every unit, four physical relationship between recording heads does not shift by wearing actuation in the case of exchange. Moreover, according to the configuration of this example which contains each recording head in a unit frame, and was fixed to it, as compared with the configuration of the recording head which was made to carry out the regurgitation of the ink of a color which is different by the recording head of one, there is a degree of freedom on a design from

the beginning.

[0033] In addition, in drawing 2 , a reference mark 4005 is the porosity member which can absorb ink, and is arranged between the orifice arrangement sides of each adjoining recording head 2000. Thereby, when wiping of the orifice arrangement side is carried out with a blade, the ink adhering to a blade is absorbed and it can prevent that color ink which is different in a contiguity orifice arrangement side carries out the reattachment.

[0034] In drawing 3 , the upper housing 4506 and the side-face housing 4006 are fixed to the unit frame 4000, respectively. in immobilization of upper housing, positioning of the upper housing 4506 at the time of immobilization should do by inserting one pair of pins 4504 (one side being un-illustrating) prepared in this in the hole 4011 prepared in the upper limit side of the outer wall plate 4001 of the unit frame 4000 -- moreover It is fixed by hanging the projection on the hanging plate 4505 formed in the both ends of upper housing (un-illustrating) with the elastic energization force of the hanging plate 4505 on the crevice 4010 formed in the outer wall plate. Immobilization in the unit frame of the side-face housing 4006 is made like the upper housing 4506 using the hanging plate 4008 of the pair of housing 4006, and the crevice 4007 of the unit frame 4000.

[0035] Two or more pads 4502 as electric contact by the side of a recording head 2000 were formed in the part equivalent to the outside surface of the upper housing 4506, and each of this pad 4502 has connected with the terminal 4501 which extends in the rear-face side of the upper housing 4506. Each terminal 4501 contacts the connection pad with which it corresponds on the substrate of a recording head, respectively, when housing 4506 is fixed to a unit frame.

[0036] The hole 4009 for making the ink supply pipe 2200 (henceforth the joint section) as ink feed zone material prepared in the recording head 2000 insert in the side-face housing 4006 is formed. In the condition of having assembled, it becomes the configuration which the ink supply pipe 2200 projected from this hole 4009, this supply pipe will be inserted in an ink cartridge side, and ink will be led to a recording head side.

[0037] Drawing 4 is the perspective view showing connection with the ink jet head unit IJU and each ink cartridge which were shown in drawing 2 and drawing 3 . Moreover, drawing 5 is the sectional view showing the condition of the ink cartridge having been connected with the ink jet head unit, and having constituted the ink jet unit.

[0038] As shown in drawing 4 , the ink tank (ink cartridge) 6000 corresponding to each ink color is connected with a recording head by inserting the ink supply pipe 2200 of the recording head corresponding to the opening (un-illustrating) separately, respectively. Moreover, it can demount separately for every ink tank of each ink color also about the case where the ink tank 6000 is demounted from a recording head. In this drawing, 2201 is a head fixed wall for fixing two or more ink jet recording heads.

[0039] By the above configuration, when the ink of the ink tank 6000 is lost, it becomes exchangeable for a new ink tank. Thus, since exchange is possible for every exhausted ink tank, useless ink can especially be lessened in the ink jet recording device of a color, and it is effective.

[0040] In drawing 5 , the supply pipe 2200 formed in the ink jet head unit IJU is inserted so that the pressure welding of the filter 700 prepared at the tip may be carried out to the absorber 6003 in the ink tank 6000. Ink 6009 is filled at the ink room 6006 which is the ink hold section, and ink is filled by some absorbers 6003 as a negative pressure generating member allotted to the plenum chamber 6004 which is a negative pressure

generating room separated by this ink room 6006 and septum 6005. The absorber 6003 has prevented that can hold ink and ink leaks from opening 6002 by this according to the capillary force. Although the ink 6009 of the ink room 6006 passes a slit 6008 and is supplied to a plenum chamber 6004, this supply becomes possible by the air corresponding to the amount of ink consumed with the ink supply by the side of the ink jet head unit IJU invading in an ink tank through the atmospheric-air free passage opening 6013, and permuting it by ink.

[0041] The description part of this example is further explained to a detail, referring to drawing 1 - drawing 5. The ink tank 6000 as an exchange mold ink cartridge slides an ink cartridge 6000 to the right from the left in drawing 5 to the ink jet head unit IJU currently fixed in equipment, and a true form voice top combines the ink supply pipe 2200 as the joint section of the ink jet head unit IJU with opening 6002 to a predetermined depth location. Here, as mentioned above, between wall 6002a of the opening 6002 of the exchange mold ink cartridge 6000, and outer wall 2200a of the ink supply pipe 2200 of the ink jet head unit IJU, the point that sufficient gap is set up is important. "Sufficient gap" as used in the field of this invention has a desirable dimension beyond the components tolerance of the ink jet head unit IJU currently fixed, and the equipment component tolerance which exists between the ink jet head unit IJU and an ink cartridge 6000. The joint section outer wall of the ink jet head unit IJU can be prevented from contacting the opening 6002 of an ink cartridge certainly by setting the dimension beyond such components tolerance as the opening 6002 of an exchange mold ink cartridge.

[0042] Moreover, "sufficient gap" is defined as follows from a viewpoint of a recording head, the ink leakage at the time of ink cartridge desorption, and ink evaporation.

[0043] As shown in drawing 6, set the path of an ink supply pipe to ϕD , and the gap in the cross section of the arbitration of outside-surface 2200a of an ink supply pipe and ink cartridge opening circles wall 6002a makes the cross-section upper part to h , and makes a cross-section lower part h' . In addition, in drawing 6, what gave the same number as drawing 5 shows the same member.

[0044] When inserting the ink supply pipe 2200 in the opening 6002 of an ink cartridge 6000 first, when there is no gap, air will be pushed in with insertion actuation of an ink supply pipe, a field with much air is formed near the ink supply pipe tip, and ink supply may become a defect.

[0045] Moreover, when ink exists that a gap is minute near the opening circles wall, ink forms a meniscus by Hazama of an opening circles wall and an ink supply pipe outer wall, and when the air pushed in by the ink supply pipe tends to come out to the exterior, the ink in which the meniscus was formed may be extruded to the ink cartridge exterior.

[0046] Since the ink usually used generally becomes it easy to form a meniscus that a gap is 0.3mm or less as a cure of this, as for a gap, it is desirable that it is $h+h' \geq 0.3\text{mm}$. More preferably, it is $h+h' \geq 0.6\text{mm}$ and meniscus formation can be barred more certainly. That is, rather than the outer diameter of an ink supply pipe, 0.3mm or more, when the path of opening of an ink cartridge is more preferably large 0.6mm or more, it can prevent ink leakage.

[0047] Moreover, when a gap is large, the ink evaporation from a negative pressure generating member poses a problem. Evaporation of ink is produced near the point periphery of an ink supply pipe, and the ink passage currently gradually formed between

the ink supply way inside an ink supply pipe (un-illustrating) and the negative pressure generating member becomes thin. In this case, if recovery etc. is performed, air bubbles etc. may be drawn in a recording head and the poor regurgitation may be produced.

[0048] As an index for preventing this, if it has the relation of $(h+h')/D \leq 0.3$ more preferably, ink evaporation will be suppressed by $(h+h')/D \leq 0.6$, and extent that does not influence ink passage formation.

[0049] Actuation of the exchange mold ink cartridge of this invention is explained using drawing 5. The ink supply pipe 2200 which supplies ink to the ink jet head unit IJU is inserted, a pressure welding is carried out to a negative pressure generating member, and it is in the condition that an ink jet recording device can work. In addition, the filter 700 for eliminating the contaminant in an ink cartridge 6000 is installed in the edge of the ink supply pipe 2200.

[0050] As an ink cartridge for which this invention is used, as shown in drawing 7, you may be the thing of a gestalt inside an ink cartridge which holds the porosity member 6003 over the whole mostly. However, when it considers that the utilization ratio of an ink cartridge mentions later, the ink cartridge shown in drawing 5 is more desirable.

[0051] Hereafter, the ink cartridge shown in drawing 5 is explained. If an ink jet recording apparatus works, ink will be breathed out from the orifice 9 of the ink jet head unit IJU, and an ink suction force will occur in an exchange mold ink cartridge. Ink 6009 passes along the clearance section 6008 of a rib edge and the ink cartridge pars basilaris ossis occipitalis 6011 from the ink hold section 6006 with the suction force, is drawn in the ink supply pipe 2200 through the negative pressure generating member hold section 6004 and the negative pressure generating member 6003 as a plenum chamber, and is supplied to an ink jet head side. Thereby, except clearance section 6008, the pressure inside the sealed ink hold section 6006 declines, and differential pressure arises between the ink hold section 6006 and the negative pressure generating member hold section 6004. If record continues, the differential pressure will continue a rise, but since the negative pressure generating member 6003 is wide opened by atmospheric air with the clearance prepared between the ink feed zone material 2200 and opening 6002, or the atmospheric-air free passage opening 6013, air goes into the ink hold section 6006 through the negative pressure generating member 6003 from the clearance section 6008 of a rib edge and the ink cartridge pars basilaris ossis occipitalis 6011. At this time, the differential pressure of Hazama of the ink hold section 6006 and the negative pressure generating member hold section 6004 is canceled. Since this actuation is repeated during ink jet record, the inside of an ink cartridge will be maintained for a certain fixed negative pressure. Moreover, except the ink adhering to the wall surface of ink hold circles, since the ink of ink hold circles can be used mostly altogether, its ink utilization ratio improves.

[0052] The own capillary tube force (or meniscus force in an ink-negative pressure generating member interface) of a negative pressure generating member etc. is discovered at the time of un-recording, and it controls that ink leaks from an ink jet recording head.

[0053] Moreover, according to the property of the ink jet head which carries out joint, the always optimal printing is attained by setting up selection of a negative pressure generating member, and the rate of the negative pressure generating member hold section and the ink hold section. Therefore, since ink capacity not only improves rather than the case where a porous body is allotted to the whole interior of the ink cartridge mentioned

above, but the ink leakage from opening for supplying ink to the exterior can be prevented effectively, it is the the best for this invention.

[0054] In addition, since the exchange mold ink cartridge of this invention is corresponded to a color ink jet recording apparatus, it can be used, respectively, being able to hold the ink of each color (for example, black, yellow, a Magenta, four colors of cyanogen) in the exchange mold ink cartridge according to individual. Moreover, it is good also as an exchange mold ink cartridge which was made to unify the ink cartridge according to individual, and separated the exchange mold ink cartridge good also as an exchange mold ink cartridge or for black ink with high operating frequency, and other color ink unification exchange cartridges. Such combination is arbitrary according to ink jet equipment.

[0055] In the exchange mold ink cartridge of this invention, in order to control the negative pressure in an ink jet recording head Selection of the negative pressure generating member 6003, a configuration, and a dimension from the first The configuration of a rib edge, A dimension, the configuration of the clearance 6008 between a rib edge and the ink cartridge pars basilaris ossis occipitalis 6011, It becomes important to optimize the roughness of a dimension, the volume rate of the negative pressure generating member hold section 6004 and the ink hold section 6006, the amount of insertion to the exchange mold ink cartridge of the ink supply pipe 2200, a configuration, a dimension, the configuration of a filter 700, a dimension, and an eye, the surface tension of ink, etc.

[0056] As a negative pressure generating member used in this example, in itself, if it has the capacity to hold ink also to a self-weight and a slight vibration of a liquid (ink), a well-known member can also be used conventionally. For example, the porous body which has the curdy object which knit fiber reticulated, and a free passage hole is mentioned. ink holding power, negative pressure generating, etc. -- adjustment -- sponge, such as easy polyurethane foam and melamine form, is desirable. Since it can adjust especially in the case of form so that it may become a desired porous consistency at the time of form manufacture, it is desirable. In addition, when heat compression processing is carried out for form and a porous consistency is adjusted further, since ink physical properties may be changed and it may have a bad influence on record grace, processing of washing etc. is needed [the decomposition product by heating is generated, and]. Moreover, although the form of a porous consistency according to it is required in order to manufacture the exchange mold ink cartridge corresponding to various ink jet recording apparatus, it is desirable to cut into the dimension of a request of form material with the specific number of cels (the number of the holes per inch) which has not performed heat compression, to carry out compression insertion at the negative pressure generating member hold section, and to adjust a porous consistency and capillary force.

[0057] As mentioned above, as long as the gap of the ink supply pipe 2200 and opening 6002 is enough, it may not be limited to this configuration and both structure and a configuration may be what kind of things.

[0058] When a negative pressure generating member is a porosity member like sponge, in order to control the recess from the ink cartridge pars basilaris ossis occipitalis of a porosity member to insertion of the ink supply pipe 2200 like drawing 5 and to maintain and secure the pressure-welding side of the filter section and a negative pressure generating member, as for the edge of the ink supply pipe 2200, it is desirable to have the

include angle (taper) of arbitration to the path of insertion of an ink supply pipe.

[0059] Moreover, the amount of insertion to the exchange mold ink cartridge 6000 of the ink supply pipe 2200 does not cause an ink leak etc. in consideration of the configuration of the configuration of the ink supply pipe, the negative pressure generating member 6003, and an ink cartridge 6000 etc. at the time of insertion, but it must determine not to raise an ink piece etc. on the way at the time of record. In addition, it is necessary to prepare free passage opening with atmospheric air in a plenum chamber 6004 side. This serves as a suitable means for the improvement in dependability to the environmental variation within the ink jet recording device mentioned later. If incorporation of air is possible, it is more desirable to make it as small as possible in consideration of evaporation of ink, although the configuration of this atmospheric-air free passage opening and especially a dimension are not limited.

[0060] Moreover, although the meniscus force with ink becomes strong and the ink leak from opening 6002 can be controlled if too narrow, although it is arbitrary about the configuration of the clearance 6008 between the rib edge shown in drawing 5, and the ink cartridge pars basilaris ossis occipitalis 6011, and a dimension, the ink supply to a plenum chamber 6004 may take the force, and an ink piece may be generated at the time of use. Moreover, since a reverse phenomenon may occur if too large, it is necessary to determine in consideration of the above. In addition, it is necessary to also determine this clearance 6008 in consideration of the location of opening 6002.

[0061] Although based also on the configuration of an exchange ink cartridge, and a dimension, it is about 0.1 to 20mm preferably, and is about 0.5 to 5mm more preferably. Moreover, as long as the configuration of a rib edge is taking into consideration the location with the above-mentioned opening 6002, it may be carrying out what kind of configuration.

[0062] Furthermore, the above becomes said [the same] of the boundary section of a rib edge and a negative pressure generating member important. For example, when the negative pressure generating member is not compressed by the rib edge, since the consistency of a member is low, circulation of ink and circulation of air become comparatively prompt, and, in high-speed record or color record, it is desirable. On the other hand, when the negative pressure generating member is compressed by for example, the rib edge, since the consistency of a member becomes high, although resistance is produced in circulation of ink, and circulation of air, failures, such as an ink leak, can be controlled to few environmental variations. Therefore, it is necessary to design these selections in consideration of the class and the environmental condition to be used of an ink jet recording device.

[0063] It is necessary to determine the volume rate of the negative pressure generating member hold section 6004 and the ink hold section 6006 in consideration of a class, an environmental condition used of an ink jet recording device. Moreover, it becomes important [relation with the negative pressure generating member to be used].

[0064] Although it can be set as arbitration according to the class of ink jet recording apparatus, also in order for the roughness of the configuration of a filter 700, a dimension, and an eye to prevent mixing of the contaminant from an ink cartridge and not to block the nozzle of a recording head, it is desirable to make it the roughness of an eye smaller than the path of an orifice.

[0065] Although a well-known thing can be used conventionally, since the ink with

which the exchange mold ink cartridge of this invention is filled up does not make an ink leak etc. cause, it is desirable that surface tension chooses from the ink in which 45 or more dyne/cm and viscosity have [in / 30 dynes /or more / 25 degrees C] more preferably 1-20cps of 1-15cps physical properties cm in 25 degrees C. Moreover, although it may be filled up to the volume limit to the ink hold section in order to maintain the negative pressure immediately after exchange mold ink cartridge opening, although the fill to the exchange mold ink cartridge of ink is arbitrary considering ink cartridge content volume as a limit, as for the ink fill to the negative pressure generating member section, it is desirable to set up below to the limitation of the ink holding power of a negative pressure generating member. In addition, the ink holding power as used in the field of this invention points out the capacity that ink can be held by the member independent at the time of infiltrating ink to a negative pressure generating member. [0066] In an ink cartridge with the ink hold section of a sealing system, to external-environment change (a temperature rise or atmospheric-pressure fall) in the condition of having been loaded into the ink jet recording device, the ink which remains in the ink room by air expansion of the ink hold section or expansion of ink is extruded out of an ink cartridge, and there is possibility of ink leak generating. Therefore, in the exchange mold ink cartridge of this invention, it is desirable to expect the air expansion volume (for a part for ink expansion to also be included although it is small) of the sealing system ink hold section according to the annular condition that the worst assumption is carried out, and to give a part for the ink movement magnitude from the ink hold section accompanying it beforehand to the negative pressure generating member hold section. However, when all are given to a part for ink movement magnitude, and the negative pressure generating member hold section, absorber insertion conditions must be made strict saying that it inserts in the condition that it inserts so that a pressure welding may be carried out as much as possible to homogeneity, or there are not Siwa and MEKURE in an absorber as much as possible so that the clearance between Hazama of the insertion condition of an absorber, a container wall, and an absorber may not be made. When this condition is not fulfilled, possibility that the above-mentioned ink leakage will arise is size.

[0067] However, even if ink becomes extruded by the rise of tank internal pressure in the worst environment by adopting the configuration which carries out adhesion closure of the ink supply pipe and pressure-welding member as the joint section so that it may mention later, since the detailed clearance between the joint sections is blockaded with adhesives or encapsulant, it does not leak out outside. Therefore, the above-mentioned absorber insertion conditions are also eased and offer of a reliable ink jet head unit is possible.

[0068] In addition, if the installation location of atmospheric-air free passage opening is the upper part [opening / by the side of the negative pressure generating member hold section], there will be especially no assignment, but in order to separate the flow of the ink in the negative pressure generating member at the time of an environmental variation from opening, it is desirable that it is in a location distant from opening. Moreover, although the number of atmospheric-air free passage openings and a configuration, magnitude, etc. can be set as arbitration in consideration of evaporation of ink, considering only ink evaporation, it is desirable to make it as small as possible.

[0069] It is desirable to seal opening and/or atmospheric-air free passage opening by a

sealant etc. at the time of the ink cartridge independent PD, and to prepare for evaporation of ink or the air expansion in an ink cartridge. It is desirable to use the compound barrier material which compound-ized reinforcing materials, aluminium foil, etc., such as compound-izing and these and paper of the barrier of a simple substance layer and the plastic film of several layers which are called a barrier material in the package field as a sealant, and cloth. It is more desirable by making the ink cartridge body quality of the material and the same quality of the material into the glue line of a barrier material, and welding with heat etc. to raise sealing nature.

[0070] Moreover, in order to control evaporation of the ink from an ink cartridge, or the inflow of the air from external atmospheric air, after inserting an ink cartridge, it is effective if the package gestalt sealed after deaerating the air in an wrapping material is taken. It is desirable to choose from a barrier material like the above-mentioned sealant in consideration of gas transmittance and liquid transmittance as an wrapping material.

[0071] A very reliable transportation gestalt can be offered without an ink leak etc. arising by choosing the above package gestalten at the time of the ink cartridge independent PD.

[0072] Although an ink cartridge body material may be what kind of ingredient conventionally used for mold goods here, it is necessary to choose from the member processed so that there might be no ingredient or effect which does not have the effect on the ink for ink jets. Moreover, it is also necessary to take the productivity of an ink cartridge into consideration. For example, an ink cartridge body is divided into ink cartridge pars-basilaris-ossis-occipitalis 6011 part and its upper part, each is really fabricated with a resin ingredient, after inserting a negative pressure generating member, ink cartridge pars-basilaris-ossis-occipitalis 6011 part and its upper part can be welded, and an ink cartridge body can be manufactured. If transparence or a translucent thing is chosen as a resin ingredient, since the ink of the ink hold section can be checked by looking from the ink cartridge outside, it can judge the replacement stage of an ink cartridge visually. Moreover, in order to make the above-mentioned sealant and joining easy, it is desirable to prepare heights in Tangu. Furthermore, it is also desirable on a design to process a crimp etc. on the external surface of an ink cartridge body.

[0073] restoration of ink -- an inflatable flexible bag technique and a manometric method -- any -- although -- it can be used. In addition, since other ink cartridge openings are not soiled, it is desirable to prepare ink restoration opening in restoration of ink at either of the tank bodies. As for ink restoration opening after ink restoration, it is desirable to carry out a plug with plastics or a metallic material.

[0074] The configuration and configuration of an exchange mold ink cartridge can perform various kinds of deformation, without deviating from the range of this invention.

[0075] It is as follows when the effectiveness of this example is summarized.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing an example of the important section of the ink jet head which can apply this invention.

[Drawing 2] It is the decomposition perspective view showing the ink jet head unit which comes to equip plurality with the ink jet head shown in drawing 1 except for the housing.

[Drawing 3] It is the decomposition perspective view of an ink jet head unit.

[Drawing 4] It is a perspective view for explaining the topology of an ink jet head unit and an ink cartridge.

[Drawing 5] It is the cross-section schematic diagram of the ink jet unit constituted by an ink cartridge connecting with an ink jet head unit.

[Drawing 6] It is the sectional view showing association with the ink supply pipe and ink cartridge which were prepared in the ink jet head.

[Drawing 7] It is the sectional view showing the ink cartridge which held the porosity member in the interior.

[Drawing 8] It is the sectional view showing other examples of the connection structure of the exchange mold ink cartridge of this invention, and an ink jet head unit.

[Drawing 9] It is the sectional view showing other examples of the connection structure of the exchange mold ink cartridge of this invention, and an ink jet head unit.

[Drawing 10] It is the perspective view showing the appearance of the most desirable example of the ink jet head unit of this invention.

[Drawing 11] It is the fragmentary sectional view showing the important section of the recording device which equipped with the ink jet head unit IJU shown in drawing 10 on the head carriage HC.

[Drawing 12] It is the approximate account Fig. of this invention ink jet cartridge and the ink jet printer using it.

[Drawing 13] (A) and (B) are the sectional views for explaining the range of the busy condition of this invention ink cartridge which can be inclined.

[Drawing 14] (a), (b), and (c) are the explanatory views showing the change in the print condition of this invention in order, respectively.

[Drawing 15] (A) is drawing of longitudinal section of the ink cartridge body for example ink jets of further others, and (B) is the cross-sectional view of the ink cartridge body for ink jets.

[Drawing 16] It is the sectional view of the ink cartridge body in which the front face of the rib of drawing 15 (A) and (B) is shown.

[Drawing 17] It is the perspective view showing an example of the ink jet printing equipment of this invention.

[Description of Notations]

1 Heat Energy Generating Component

7 Liquid Room (Head Section)

8 Ink Way

9 Delivery (Orifice)

11, 1101, 6011 Ink cartridge pars basilaris ossis occipitalis

13 Opening

14 Ball
20, 1013, 6013 Atmospheric-air free passage section
21, 1001, 6000 Ink cartridge
22, 1002, 6002 Opening (ink cartridge)
23, 1003, 6004 Negative pressure generating member hold room
25, 1005, 6005 Rib (bridge wall)
26, 1006, 6006 Ink hold section
27, 1007, 2200 Ink supply pipe
28, 1008, 6008 Minute supply pipe
29 6009 Ink
40 Horizontal Plane
100 Heater Board
300 Support Substrate
400 Orifice Plate
500 Pressure Spring
600 Ink Feed Zone Material
700 Filter
1031 Atmospheric-Air Installation Slot
1032 Negative Pressure Generating Member Control Room
1300 Ink Feed Hopper (to Liquid Room)
2000 Ink Jet Head
2200a Ink supply pipe outer wall
2201 Head Fixed Wall
2202 Simple Pressure-Welding Member
2202a Itabe
2202b Projecting part
2203 Adhesion Sealing Agent
2204 Crevice
2205 Heights
2400 Crevice
4000 Ink Jet Head Unit Frame
4001 Unit Outer Wall Plate
4002 Unit Wall Plate
4003 Head Attaching Part
4005 Porosity Member
4006 Side-Face Housing
4007 4010 Crevice
4008 4505 Hanging plate
4009 Hole
4011 Hole
4501 Terminal
4502 Connection Pad
4504 Pin
4506 Upper Housing
4514 Connector
4515 Head Side Edge Child

5002 Cap
5004 Leading Screw
5005 Spiral Slot
5008 Gear
5017 Cleaning Blade
5018 Body Support Plate
5019 Blade Migration Member
5030 Connection Plate
5031 Connection Pad
IJU Ink jet head unit
HC, CR Carriage
HC1 Positioning heights
HC2 Loading section
HC3 Lobe
HC4 Slope

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(33)優先権主張国 日本 (J P)

(71)出願人 000001007

キヤノン株式会社

東京都大田区下丸子3丁目30番2号

(72)発明者 阿部 力

東京都大田区下丸子3丁目30番2号 キヤ
ノン株式会社内

(72)発明者 日隈 昌彦

東京都大田区下丸子3丁目30番2号 キヤ
ノン株式会社内

(72)発明者 杉本 仁

東京都大田区下丸子3丁目30番2号 キヤ
ノン株式会社内

(74)代理人 弁理士 谷 義一 (外1名)

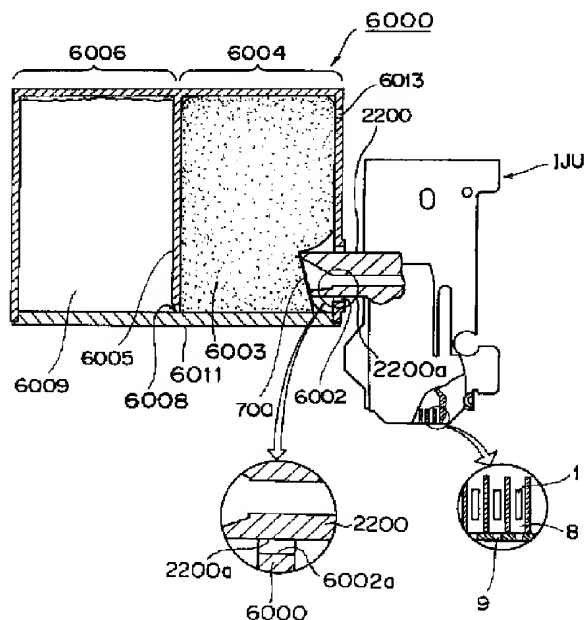
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(54)【発明の名称】 インクカートリッジおよび該インクカートリッジを有するインクジェットユニット、該インクジェットユニットを有するインクジェット装置

(57)【要約】

【目的】 着脱が容易であり、着脱時に記録ヘッドにかかる負荷を最小限に抑制した交換型インクカートリッジを提供することを目的とする。

【構成】 交換型インクカートリッジ6000の開口部6002の内側面6002aとインクジェットインクジェットヘッドユニットIJUのインク供給管2200の外壁2200aとの間には十分な間隙CLが設定されている。



【特許請求の範囲】

【請求項1】 インクを吐出するためのインクジェットヘッドと、

該インクジェットヘッドに供給するためのインクを収容するインクカートリッジとを有するインクジェットユニットにおいて、

前記インクジェットヘッドは、前記インクカートリッジからインクを導くインク供給部材を有するものであり、

前記インクカートリッジは、内部に負圧発生部材を有し、さらに、該負圧発生部材と前記インク供給部材とを接触可能にする開口部を有するものであり、

該開口部は、前記負圧発生部材と前記インク供給部材とが接触した状態のときに、前記インク供給部材との間に間隙を形成するものであることを特徴とするインクジェットユニット。

【請求項2】 請求項1に記載のインクジェットユニットにおいて、さらに前記インクジェットヘッドとインクカートリッジが結合した状態で前記間隙と大気との間に介在する圧接部材を有し、該圧接部材はインクジェットヘッドもしくはインクカートリッジのどちらか一方に設けられることを特徴とするインクジェットユニット。

【請求項3】 請求項2に記載のインクジェットユニットにおいて、前記圧接部材は前記インクカートリッジを構成する材料よりも弾性変形することを特徴とするインクジェットユニット。

【請求項4】 請求項1に記載のインクジェットユニットにおいて、前記インクジェットヘッドは、熱エネルギーを利用してインクに気泡を生じさせ、該気泡の生成に伴ってインクを吐出する機構を有することを特徴とするインクジェットユニット。

【請求項5】 インクジェットヘッドに供給するためのインクを収容するインクカートリッジであって、負圧発生部材と、該負圧発生部材を収容する負圧発生部材収容室とを有するインクカートリッジにおいて、

該負圧発生部材収容室に設けられ、かつ、前記インクジェットヘッドのインク係合部材と前記負圧発生部材とを連結させるための開口部を有し、該開口部は、インク供給部材と負圧発生部材とが接触した状態で前記インク供給部材との間に間隙を形成するものであることを特徴とするインクカートリッジ。

【請求項6】 インクを吐出するためのインクジェットヘッドと、該インクジェットヘッドに供給するためのインクを収容するインクカートリッジと、前記インクジェットヘッドに設けられ、かつ、前記インクカートリッジからインクを導くインク供給部材とを有するインクジェットユニットを有するインクジェット装置において、

前記インクカートリッジは、内部に負圧発生部材を有し、さらに、該負圧発生部材と前記インク供給部材とを接触可能にする開口部を有するものであり、該開口部は、前記負圧発生部材と前記インク供給部材とが接続し

た状態のときに、前記インク供給部材との間に間隙を形成するものであり、

前記インクジェットヘッドユニットを着脱可能に搭載するキャリッジと、

該キャリッジを移動させる移動手段とを有することを特徴とするインクジェット装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、インクジェットヘッドに供給されるインクを貯留するインク容器、および該インク容器を備えたインクジェットユニットおよびインクジェット装置に関し、インクジェット技術を使用する複写機、ファクシミリ等の記録機器、通信機器そして布等に画像等をプリントする捺染機器等に使用可能なものである。

【0002】

【背景技術】 プリンタ、ファックス、複写装置等、各種機器において、紙、布等の被記録媒体に記録を行う手段としてインクジェット記録装置が広く利用されつつある。

【0003】 インクジェット記録装置は、被記録媒体に対向した記録ヘッドから当該被記録媒体へインクを吐出する構成となっており、インクジェット記録装置として独立した機器ケース内に納めて単体構成としてある例、そして記録情報を作成し入力する各種電子機器、例えばワードプロセッサ、パーソナルコンピュータ等の機器ケース内に内蔵させ電子機器と一体構成した例とがある。

【0004】 これらのインクジェット記録装置に使用されているインク収容部の構成に対しては、一般に記録時に記録ヘッドから吐出されるインク量に見合ったインクを良好に供給することができるとともに、非記録時には、吐出口からのインク漏れなどの不都合がないことが要求される。通常、インク収容部の構成はカートリッジ型式を採用し、交換可能とされている。

【0005】 また、インクジェット用のインク収容部は、記録装置の小型化を実現するためにインクジェットヘッドと一体化される場合もある。この場合、インク収容部内のインクがインクジェットヘッドから吐出できなくなると、ヘッドと共に廃棄される。しかしながら、インク収容部にはインクが残っており、このインク収容部内に残存するインクの量は、改良を加えても、前述のインク漏れ防止のためにインク収容部内のほぼ全体に収納されている負圧発生体であるスポンジのインク保持能力に支配され、比較的多いものとなっていた。さらに、記録ヘッド自体の性能が低下しないうちに、記録ヘッドがインク収容部と共に交換されることになり、製品のコストアップおよびコストパフォーマンスに対して重大な影響を与えていた。

【0006】 前述のコストアップ等に対する対策として、記録ヘッドとインクカートリッジとを着脱可能に一

体化する形態を採用し、インクカートリッジのみの交換を可能とした構成が挙げられる。この場合には、記録ヘッドとの間でインクカートリッジの脱着をスムーズに行え、その脱着の際のインク漏れなどがなく、装着時には確実に記録ヘッドにインクを供給することが加重に要求される。

【0007】従来のインクジェット記録装置に使用される記録ヘッドと一体のインク収容部の形態としては、特開昭63-87242号公報に開示されている。これは、インク収容部内に発泡材が配設された複数のインク射出オリフィスを備えたインクジェットユニットである。このインク収容部においては、発泡材であるポリウレタンフォームのような多孔質媒体にインクを貯蔵するために多孔質媒体の毛細管力による負圧の発生と、インクの保持、すなわちインク収容部からのインク漏れ防止を達成している。

【0008】しかしながら、インク収容部内のほぼ全体に多孔質媒体を必要とすることからインクの充填量が制限されるとともに多孔質媒体中に使用されずに残るインク量が多く、インクの使用効率が悪いという問題があった。また、多孔質媒体中にインクを充填しているため、インクの残量検知が困難であり、さらに、インク消費期間中にインク収容部内の負圧をほぼ一定に保つことが困難であるという課題があった。

【0009】かかる課題を解決すべく改良を加えた技術が特開平2-522号公報に開示されている。この公報には、1次インク貯蔵部と2次インク貯蔵部とインクジェット記録ヘッドとの間を多孔質部材でつないだインクジェット記録カートリッジが開示されている。このようなカートリッジにおいては、多孔質部材をインク貯蔵部は内蔵せずにインク流路中にのみ配置したことによりインクの使用効率の向上を可能にしている。また、2次インク貯蔵部を設けることにより、温度上昇による圧力低下に伴う1次インク貯蔵部の空気膨張に起因した1次インク貯蔵部からの流出インクを溜めることができるので、記録時の記録ヘッドへの負圧を実質上一定に維持できる。

【0010】しかしながら、負圧発生部材がインク流路中に配置されることから負圧発生部材としての多孔質媒体はインクを充分含浸しており、非記録時において多孔質媒体の毛細管力による負圧の発生が不十分となり、わずかな衝撃によりインクジェット記録ヘッドのオリフィスからインクが漏れるという問題があった。また、上記インクジェット記録ヘッドは予めインク収容部と一体に形成されているものであるため、前述したようなインクカートリッジをインクジェット記録ヘッドに装着する交換型インクカートリッジの場合には、適用できないという課題があった。

【0011】また、インクジェットヘッドとインクカートリッジとを着脱可能としてインクジェットユニットを

構成して、記録装置に設けられたキャリッジ等に設ける場合には、インクカートリッジのみの交換時のインク漏れが問題となる。この場合のインク漏れは、記録ヘッドから離間した位置にインクカートリッジを設ける場合と異なり、記録装置内を汚染し、記録ヘッドと本体との電氣的接点部における接続不良や、被記録媒体の汚損等を招くおそれがある。この問題は、近年、装置の小型化のために、キャリッジ上に記録ヘッドとインクカートリッジを配する構成を採用しているため、重大な技術課題となっている。

【0012】そしてまた、記録ヘッドとインクカートリッジとを通過させるために、記録ヘッドにインク供給管を設ける構成では、インクジェット記録装置の記録速度を速くする等のため、短時間に多くのインクを供給する必要がある、インク供給管は太いものが要望される。そのためインクカートリッジを交換しインク供給管を挿入しインクを保持する吸収体に圧接したとき、吸収体はインク供給管の先端部で押圧・圧縮され、吸収していたインクがしみ出し、インクカートリッジの外部に漏れ記録装置あるいは被記録媒体を汚すことがあった。

【0013】さらに、前述したように、インクカートリッジ脱着が容易であることも要求されているので、これらをすべて満足させるのは困難であった。

【0014】そして、前述した記録ヘッドは、吐出性能を常に高く保つために、その設置位置が厳密に設定されているので、外力振動等によりその位置がずれるのを防止しなければならない。この観点から、インクカートリッジの脱着時に、不用意にインクカートリッジによって記録ヘッドを押してしまうことがないようにする必要性があった。この対策としては、ある特定の方向にしか、記録ヘッドとインクカートリッジの脱着時にインクカートリッジが負荷を与えない構成を採用するなどが挙げられるが、この場合、各種の方向規制部材を設けねばならず、装置の複数化や大型化を招くことになる。

【0015】

【発明が解決しようとする課題】本発明は、記録ヘッドとインク容器の着脱が容易である交換型インクジェットユニットを提供することを目的とし、さらにその着脱時に、記録ヘッドに対してインク容器がかける負荷を小さいものとするを目的としている。

【0016】また、さらに本発明はインクジェット記録装置に前記インクジェットユニットを搭載した状態で長期間性能を維持できるインクジェットユニットを提供することを目的としている。

【0017】また、インク容器からのインク漏れを、使用形態にかかわらず防止できる構成を提供することも目的としている。

【0018】

【課題を解決するための手段】上記目的を達成するために、本発明は、インクジェットヘッドに設けられたイン

ク供給部材としてのジョイント部と連結するための開口部を有し、かつ負圧発生部材を収容した収容部を有する交換型インクカートリッジにおいて、前記開口部はその内壁が前記インクジェット記録ヘッドのジョイント部の外壁との間に十分な間隙を有する構成を提案する。

【0019】上記構成を用いることにより、インクカートリッジの開口部がインクジェットヘッドのジョイント部に接触しないジョイントフリーとしたので、インクカートリッジ内の負圧発生部材を押し込む力を除く外力がインクジェットヘッドに加わることはなく、常に良好な印字を提供できるインクカートリッジやインクジェットユニット、インクジェット装置を提供できる。

【0020】そして、インクジェットヘッドとインクカートリッジとを結合させる場合に、前記ジョイント部と開口部との間に形成された間隙を覆う圧接部材をインクジェットヘッドとインクカートリッジのどちらかに設ける構成も提案するものである。

【0021】

【作用】本発明によれば、インクカートリッジの開口部がインクジェットヘッドのジョイント部に接触しないジョイントフリーとしたので、インクカートリッジ内の負圧発生部材を押し込む力を除く外力がインクジェットヘッドにかかることはなく、常に良好な印字を保証することができる。

【0022】

【実施例】以下、図面を参照して本発明の実施例を詳細に説明する。

【0023】図1は、本発明の一実施例で用いられるインクジェットヘッド（以下、記録ヘッドとも言う）の要部を示す概略断面図である。

【0024】図1に示されるように、記録ヘッドは、熱エネルギー発生素子を設けた基板100（以下ヒーターボードと称す）と、該基板100と接合されて記録液体（以下インクと称す）を収容する液室7およびインク路8を構成する凹凸部を有した基板1300とからなる。この基板（以下、溝付天板ともいう）1300は、インク路8に連通したインクを吐出するためのインク吐出口（以下、オリフィスともいう）9が設けられたオリフィスプレート400を一体的に具えている。

【0025】ヒーターボード100は支持基板（以下、支持体ともいう）300に接着剤により接着固定され、溝付天板1300は、図1に示すようにヒーターボード100上に配置されている熱エネルギー発生素子1が、この接合によって構成されるインク路8内に含まれるようヒーターボード100に仮接着され、溝付天板が具えるオリフィスプレート400は、支持基板300の前端面に前ダレのように配置される。

【0026】そしてさらに、押さえバネ500によってヒーターボード100と溝付天板1300は圧着固定される。なお、押さえバネ500は基板300と係合し、

ヒーターボード100と溝付天板1300を挟持する構成となっている。

【0027】インクは、インク供給路部材600から、溝付天板1300の上部に設けられたインク供給口1500を通り供給される。インク供給路部材600は突起棒を有し、支持基板300上に設けられた貫通穴にこの突起棒が挿入されて、熱かしめされることにより、支持基板300に固定される。

【0028】図2および図3は、それぞれ本発明の一実施例を示し、図1の構造を有する複数の記録ヘッド2000を装着する記録ヘッドユニットの分解斜視図であり、図2においては、上記ユニットのハウジング部材の図示が省略されている。

【0029】本例の記録ヘッドユニットは、それぞれ異なる色のインクを吐出可能な4個の記録ヘッドを装着し、かつこれら記録ヘッド相互の位置関係を正確に定めることができるものである。なお、上記4個の記録ヘッドが同一色のインクを吐出してもよく、この場合、高速記録あるいはインク滴の数に応じた階調表現が可能となり、また、同一色で濃度の異なるインクをそれぞれ吐出するようにしても階調記録が可能となる。

【0030】図2において、参照符号4000はインクジェットヘッドを複数有するインクジェットヘッドユニット枠を示す。ユニット枠4000は、コの字状の外壁板4001と、各記録ヘッドを収容するためのヘッド保持部4003を限界する3枚の内壁板4002を具える。図1で説明した記録ヘッド2000は、そのインク吐出口を図中下方に向けた状態でそれぞれのヘッド保持部4003に収納される。ユニット枠4000における各記録ヘッドの位置決めは、各ヘッド保持部に設けられる3方向の基準面に各記録ヘッドに設けられる基準面を突き当て、その後接着剤等によって固定される。この場合において、各記録ヘッド2000においてその基準面とオリフィスとの位置関係は高精度に設定される必要がある。

【0031】なお、各記録ヘッド2000の位置決めについては、上述の基準面を用いる方法ではなく、TVカメラ等による画像上で位置決めし、その後接着によって固定するようにしてもよい。

【0032】このように、本例によれば4個の記録ヘッドをユニット枠に接着固定してインクジェットヘッドユニットを構成し、記録ヘッドの交換はユニット毎に行うようにするので、交換の際の装着動作によって4個の記録ヘッド相互の位置関係がずれることがない。また、ユニット枠に個々の記録ヘッドを収納し固定するようにした本例の構成によれば、当初から一体の記録ヘッドで異なる色のインクを吐出するようにした記録ヘッドの構成と比較して設計上の自由度がある。

【0033】なお、図2において参照符号4005はインクを吸収可能な多孔質部材であり、隣接する各記録ヘ

ッド2000のオリフィス配設面の間に配設される。これにより、ブレードによってオリフィス配設面をワイピングしたときにブレードに付着するインクを吸収し、隣接オリフィス配設面に異なる色インクが再付着することを防止できる。

【0034】図3において、上ハウジング4506および側面ハウジング4006はそれぞれユニット枠4000に固定される。上ハウジングの固定においては、これに設けられた1対のピン4504（一方は不図示）がユニット枠4000の外壁板4001の上端面に設けられた孔4011に挿入されることによって固定時の上ハウジング4506の位置決めがなされ、また、上ハウジングの両端に形成された掛止板4505上の突起（不図示）が、外壁板に形成された凹部4010に掛止板4505の弾性付勢力を伴って掛止されることにより固定される。側面ハウジング4006のユニット枠への固定は、ハウジング4006の一对の掛止板4008とユニット枠4000の凹部4007とを用いて、上ハウジング4506と同様になされる。

【0035】上ハウジング4506の外表面に相当する部分には記録ヘッド2000側の電気接点としてのパッド4502が複数設けられ、このパッド4502のそれぞれは上ハウジング4506の裏面側に延在する端子4501と接続している。それぞれの端子4501は、ハウジング4506がユニット枠に固定されたとき、記録ヘッドの基板上のそれぞれ対応する接続パッドと接触する。

【0036】側面ハウジング4006には、記録ヘッド2000に設けられたインク供給部材としてのインク供給管2200（以下、ジョイント部とも言う）を挿通させるための孔4009が形成されている。組み立てた状態ではこの孔4009からインク供給管2200が突出した構成となり、この供給管がインクカートリッジ側に挿入され、記録ヘッド側ヘインクを導くことになる。

【0037】図4は、図2および図3に示したインクジェットヘッドユニットIJUと各インクカートリッジとの接続を示す斜視図である。また、図5は、インクジェットヘッドユニットとインクカートリッジが接続されてインクジェットユニットを構成した状態を示す断面図である。

【0038】図4に示されるように、各インク色に対応したインクタンク（インクカートリッジ）6000は、その開口部（不図示）に、それぞれ対応する記録ヘッドのインク供給管2200を個々に挿入することによって記録ヘッドと接続する。また、インクタンク6000を記録ヘッドから取外す場合についても、各インク色のインクタンク毎に個々に取外すことができる。同図において、2201は複数のインクジェット記録ヘッドを固定するためのヘッド固定壁である。

【0039】以上の構成により、インクタンク6000

のインクが無くなった時点で新しいインクタンクとの交換が可能となる。このように、使い切ったインクタンク毎に交換ができるため、カラーのインクジェット記録装置では無駄なインクを少なくでき特に有効である。

【0040】図5において、インクジェットヘッドユニットIJUに設けられた供給管2200は、その先端に設けられたフィルタ700をインクタンク6000内の吸収体6003に圧接するように挿入される。インク収容部であるインク室6006にはインク6009が満たされており、このインク室6006と隔壁6005によって隔てられる負圧発生室である前室6004に配された負圧発生部材としての吸収体6003の一部にもインクが満たされている。吸収体6003はその毛管力によってインクを保持することができ、これにより、開口部6002からインクが漏れることを防止している。インク室6006のインク6009はスリット6008を通過し前室6004へ供給されるが、この供給は、インクジェットヘッドユニットIJU側へのインク供給に伴って消費されたインク量に対応する空気が大気連通口6013を介してインクタンク内に侵入しインクと置換されることによって可能となる。

【0041】図1～図5を参照しながら本実施例の特徴部分をさらに詳細に説明する。交換型インクカートリッジとしてのインクタンク6000は、実形態上は装置内に固定されているインクジェットヘッドユニットIJUに対して図5において左から右ヘインクカートリッジ6000をスライドして開口部6002にインクジェットヘッドユニットIJUのジョイント部としてのインク供給管2200を所定の深さ位置まで結合する。ここで、上述したように交換型インクカートリッジ6000の開口部6002の内壁6002aとインクジェットヘッドユニットIJUのインク供給管2200の外壁2200aとの間には十分な間隙が設定されている点が重要である。本発明でいう『十分な間隙』とは固定されているインクジェットヘッドユニットIJUの部品公差および、インクジェットヘッドユニットIJUとインクカートリッジ6000との間に存在する装置部品公差以上の寸法が望ましい。このような部品公差以上の寸法を交換型インクカートリッジの開口部6002に設定することにより、確実にインクジェットヘッドユニットIJUのジョイント部外壁がインクカートリッジの開口部6002に接触しないようにすることができる。

【0042】また、記録ヘッドとインクカートリッジ脱着時のインク漏れとインク蒸発の観点から、『十分な間隙』は以下のように定義される。

【0043】図6に示したように、インク供給管の径をφDとし、インク供給管の外表面2200aと、インクカートリッジ開口部内壁6002aとの任意の断面における間隙は、断面上方をh、断面下方をh'とする。なお、図6において、図5と同一の番号を付与したものは

同一の部材を示す。

【0044】まずインク供給管2200をインクカートリッジ6000の開口部6002に挿入する場合、間隙がないとインク供給管の挿入動作に伴って空気が押し込まれることになり、インク供給管先端近傍に空気が多い領域が形成されインク供給が不良になる可能性がある。

【0045】また、間隙が微小であると、開口部内壁近傍にインクが存在した場合に開口部内壁とインク供給管外壁との間でインクがメニスカスを形成し、インク供給管によって押し込まれた空気が外部へ出ようとする時に、メニスカスを形成したインクをインクカートリッジ外部へ押し出してしまう可能性がある。

【0046】これの対策として、通常一般に用いられているインクは、間隙が0.3mm以下であるとメニスカスを形成しやすくなるので、間隙は $h+h' \geq 0.3\text{mm}$ であることが望ましい。より好ましくは、 $h+h' \geq 0.6\text{mm}$ であり、より確実にメニスカス形成を妨げることができる。すなわち、インクカートリッジの開口部の径が、インク供給管の外径よりも0.3mm以上、より好ましくは0.6mm以上大きいと、インク漏れが防止できることになる。

【0047】また、間隙が大きい場合には、負圧発生部材からのインク蒸発が問題となる。インクの蒸発は、インク供給管の先端部外周近傍から生じ、徐々にインク供給管の内部のインク供給路（不図示）と負圧発生部材との間に形成されているインク流路が細くなってくる。この場合に、回復処理等を行うと記録ヘッド内に気泡等を引き込み、吐出不良を生じる可能性がある。

【0048】これを防止するための指標として、 $(h+h')/D \leq 0.6$ 、より好ましくは $(h+h')/D \leq 0.3$ の関係にあれば、インク蒸発はインク流路形成に影響しない程度に抑えられる。

【0049】本発明の交換型インクカートリッジの動作を図5を用いて説明する。インクジェットヘッドユニットIJUにインクを供給するインク供給管2200が挿入され、負圧発生部材に圧接してインクジェット記録装置が稼動可能な状態である。なお、インク供給管2200の端部にはインクカートリッジ6000内のごみを排除するためのフィルタ700が設置されている。

【0050】本発明が用いられるインクカートリッジとしては、図7に示したようにインクカートリッジの内部のほぼ全体にわたって多孔質部材6003を収容する形態のものであってもよい。ただし、後述するようにインクカートリッジの使用効率を考慮すると、図5に示したインクカートリッジの方が好ましい。

【0051】以下、図5に示されたインクカートリッジについて説明する。インクジェット記録装置が稼動するとインクジェットヘッドユニットIJUのオリフィス9からインクが吐出され交換型インクカートリッジにインク吸引力が発生する。インク6009はその吸引力によ

りインク収容部6006からリブ端部とインクカートリッジ底部6011との隙間部6008を通り、前室としての負圧発生部材収容部6004および負圧発生部材6003を通してインク供給管2200内に引き込まれインクジェットヘッド側に供給される。これにより隙間部6008以外は密閉しているインク収容部6006の内部の圧力が低下し、インク収容部6006と負圧発生部材収容部6004との間に圧力差が生じる。記録が継続するとその圧力差は上昇を続けるが、負圧発生部材6003はインク供給部材2200と開口部6002との間に設けられた隙間または大気連通口6013により大気に開放されているため、空気が負圧発生部材6003を通してリブ端部とインクカートリッジ底部6011との隙間部6008からインク収容部6006に入る。この時点でインク収容部6006と負圧発生部材収容部6004との間の圧力差が解消される。インクジェット記録中はこの動作が繰り返されるので、ある一定の負圧がインクカートリッジ内が維持されることになる。また、インク収容部内のインクは、インク収容部内の壁面に付着するインク以外はほぼ全て使用できるためインク使用効率が向上する。

【0052】非記録時においては、負圧発生部材自身の毛細管力（あるいはインク-負圧発生部材界面でのメニスカス力）などが発現され、インクジェット記録ヘッドからインクが漏れることを抑制する。

【0053】また、ジョイントするインクジェットヘッドの特性に応じて、負圧発生部材の選択および負圧発生部材収容部とインク収容部の割合の設定を行うことにより、常に最適な印字が可能となる。従って、前述したインクカートリッジ内部全体に多孔質体を配した場合よりもインク収容量が向上するだけでなく、外部へインクを供給するための開口部からのインク漏れも効果的に防止できるので、本発明に最適である。

【0054】なお、本発明の交換型インクカートリッジをカラーインクジェット記録装置に対応するために各色（例えばブラック、イエロー、マゼンタ、シアンの4色）のインクをそれぞれ個別の交換型インクカートリッジに収容して使用することができる。また、個別のインクカートリッジを一体化させて交換型インクカートリッジとしてもよく、あるいは、使用頻度の高いブラックインク用の交換型インクカートリッジと他のカラーインク-一体化交換カートリッジを分離した交換型インクカートリッジとしてもよい。これらの組み合わせはインクジェット装置に合わせて任意である。

【0055】本発明の交換型インクカートリッジにおいて、インクジェット記録ヘッドにおける負圧を制御するためには、負圧発生部材6003の選定、形状、寸法はもとより、リブ端部の形状、寸法、リブ端部とインクカートリッジ底部6011との隙間6008の形状、寸法、負圧発生部材収容部6004とインク収容部600

6の容積割合、インク供給管2200の交換型インクカートリッジへの挿入量、形状、寸法、フィルタ700の形状、寸法、目の荒さおよびインクの表面張力などを最適化することが重要となる。

【0056】本実施例において用いられる負圧発生部材としては、それ自身、液体（インク）の自重およびわずかな振動に対してもインクを保持する能力を有するものであれば従来公知の部材をも使用できる。例えば、繊維を網状に編み込んだ綿状体や連通孔を有する多孔質体などが挙げられる。インク保持力および負圧発生などが調整容易なポリウレタンフォーム、メラミンフォームなどのスポンジが好ましい。特にフォームの場合には、フォーム製造時に所望の多孔密度となるように調整できるので好ましい。なお、フォームを熱圧縮処理をしてさらに多孔密度を調整した場合には、加熱による分解物が発生し、インク物性を変化させ記録品位に悪影響を及ぼす場合があるので洗浄などの処理が必要となる。また、各種インクジェット記録装置に対応した交換型インクカートリッジを製造するためそれに応じた多孔密度のフォームが要求されるが、熱圧縮を施していない特定のセル数（1インチ当りの空孔の数）を持つフォーム材を所望の寸法にカットし、負圧発生部材収容部に圧縮挿入し、多孔密度、毛管力を調整することが好ましい。

【0057】上述したように、インク供給管2200と開口部6002との間隙が十分であれば、本構成に限定されるものではなく、両者の構造、形状はいかなるものであってもよい。

【0058】負圧発生部材がスポンジのような多孔質部材の場合には図5のようにインク供給管2200の挿入に対して多孔質部材のインクカートリッジ底部からの逃げを抑制し、かつ、フィルタ部と負圧発生部材との圧接面を維持、確保するためにインク供給管2200の端部はインク供給管の挿入方向に対して任意の角度（テーパ）を有することが好ましい。

【0059】また、インク供給管2200の交換型インクカートリッジ6000への挿入量は、そのインク供給管の形状、負圧発生部材6003、インクカートリッジ6000の形状などを考慮して挿入時にインク洩れなどを起こさず、記録時には途中でインク切れなどを起こさないように決定しなければならない。なお、大気との連通口を前室6004側に設ける必要がある。これは後述するインクジェット記録装置内での環境変化に対する信頼性向上に好適な手段となる。この大気連通口の形状、寸法は特に限定されないが、空気の取り込みが可能であればインクの蒸発を考慮してできるだけ小さくする方が好ましい。

【0060】また、図5に示したリブ端部とインクカートリッジ底部6011との隙間6008の形状、寸法については任意であるが、あまりにも狭いとインクとのメニスカス力が強くなり、開口部6002からのインク洩

れは抑制できるが、前室6004へのインク供給に力を要し、使用時にインク切れを発生する可能性がある。また、あまりにも広いと逆の現象が発生する可能性があるため上記を考慮して決定する必要がある。なお、この隙間6008もまた、開口部6002の位置を考慮して決定する必要がある。

【0061】交換インクカートリッジの形状、寸法にもよるが、好ましくは0.1から20mm程度であり、より好ましくは0.5から5mm程度である。また、リブ端部の形状は、上述の開口部6002との位置を考慮していればいかなる形状をしていてもよい。

【0062】さらに、リブ端部と負圧発生部材との境界部も上記同様重要となる。例えばリブ端部により負圧発生部材が圧縮されていない場合には、部材の密度が低いことためインクの流通および空気の流通が比較的速やかとなり、高速記録やカラー記録の場合に好ましい。一方、例えばリブ端部により負圧発生部材が圧縮されている場合には、部材の密度が高くなるためインクの流通および空気の流通に抵抗を生じるもののわずかな環境変動に対してはインク洩れなどの障害を抑制できる。よって、これらの選択は、インクジェット記録装置の種類や使用する環境条件を考慮して設計する必要がある。

【0063】負圧発生部材収容部6004とインク収容部6006の容積割合は、インクジェット記録装置の種類や使用される環境条件などを考慮して決定する必要がある。また、使用する負圧発生部材との関連も重要となる。

【0064】フィルタ700の形状、寸法、目の荒さは、インクジェット記録装置の種類によって任意に設定できるが、インクカートリッジからのごみの混入を防止し記録ヘッドのノズルを詰まらせないためにもオリフィスの径よりも小さい目の荒さにすることが好ましい。

【0065】本発明の交換型インクカートリッジに充填するインクは、従来公知のものが使用できるが、インク洩れなどを引き起こさないために表面張力が25℃において30dyne/cm以上、より好ましくは45dyne/cm以上、粘度が25℃において1~20cps、より好ましくは1~15cpsの物性を持つインクから選択することが好ましい。また、インクの交換型インクカートリッジへの充填量は、インクカートリッジ内容積を限度として任意であるが、交換型インクカートリッジ開封直後の負圧を維持するためにインク収容部への容積限度まで充填してもよいが、負圧発生部材部へのインク充填量は負圧発生部材のインク保持力の限界以下で設定することが好ましい。なお、本発明でいうインク保持力とは、負圧発生部材にインクを含浸させた際の部材単独でインクを保持できる能力を指すものである。

【0066】密閉系のインク収容部を持つインクカートリッジにおいては、インクジェット記録装置内に装填された状態での外部環境変化（温度上昇、あるいは気圧低

下) に対しては、インク収容部の空気膨張やインクの膨張によりインク室に残存しているインクをインクカートリッジ外へ押し出し、インク洩れ発生の可能性がある。従って、本発明の交換型インクカートリッジにおいては、最悪想定される環状状態に応じた密閉系インク収容部の空気膨張体積（僅かではあるがインク膨張分も含む）を予想し、それに伴うインク収容部からのインク移動量分を負圧発生部材収容部に予め持たせることが好ましい。しかし、インク移動量分と負圧発生部材収容部に全て持たせた場合には、吸収体の挿入状態、容器内壁と吸収体との間の隙間ができないように、可能な限り均一に圧接されるように挿入するとか、吸収体にシワ、メクレができるだけない状態で挿入するというに、吸収体挿入条件を厳格にしなければならない。この条件が満たされない場合には、前述のインク漏れが生じる可能性が大である。

【0067】ただし後述するように、ジョイント部としてのインク供給管と圧接部材とを接着封止する構成を採用することにより、万が一、最悪の環境においてタンク内圧の上昇によりインクが押し出されそうになっても、ジョイント部の微細な隙間が接着剤または封止剤などにより閉塞されていることから、外部に漏出することはない。従って、上記吸収体挿入条件も緩和され、信頼性の高いインクジェットヘッドユニットの提供が可能である。

【0068】なお、大気連通口の設置位置は、負圧発生部材収容部側の開口部より上部ならば特に指定はないが、環境変化時の負圧発生部材中のインクの流れを開口部から離すために、開口部から遠い位置にあるのが好ましい。また、大気連通口の数および形状、大きさなどはインクの蒸発を考慮して任意に設定することができるが、インク蒸発のみを考えると可能な限り小さくすることが望ましい。

【0069】インクカートリッジ単独の物流時においては、開口部および／または、大気連通口をシール材などで密閉してインクの蒸発やインクカートリッジ内の空気膨張に備えることが好ましい。シール材としては、包装分野においてバリヤ材と称される単体層のバリヤおよび数層のプラスチックフィルムの複合化およびこれらと紙、布などの補強材またアルミニウム箔などを複合化した複合バリヤ材を使用することが好ましい。インクカートリッジ本体材質と同様な材質をバリヤ材の接着層とし、熱などで溶着することによって密閉性を上げることがより好ましい。

【0070】また、インクカートリッジからのインクの蒸発あるいは外部大気からの空気の流入を抑制するためには、インクカートリッジを挿入後は包材内の空気を脱気してから密閉する包装形態をとれば効果的である。包材としては、気体透過度および液体透過度を考慮し、上記シール材同様バリヤ材から選択することが好ましい。

【0071】上述のような包装形態を選択することによってインクカートリッジ単独の物流時に、インク洩れなどが生じることもなく非常に信頼性の高い輸送形態が提供できることになる。

【0072】ここでインクカートリッジ本体材料は従来成形品に用いられるいかなる材料であってもよいが、インクジェット用インクへの影響がないような材料あるいは影響がないように処理された部材から選択する必要がある。また、インクカートリッジの生産性を考慮することも必要となる。例えば、インクカートリッジ本体をインクカートリッジ底部6011部分とその上部部分とに分割して樹脂材料にてそれぞれを一体成形し、負圧発生部材を挿入後、インクカートリッジ底部6011部分とその上部部分を溶着してインクカートリッジ本体を製造することができる。樹脂材料に透明あるいは半透明なものを選択すればインク収容部のインクはインクカートリッジ外部から視認することができるのでインクカートリッジの取り替え時期を目視にて判断することができる。また、上記シール材と溶着を容易にするためにタンク側に凸部を設けることが好ましい。さらに、インクカートリッジ本体外面にシボなどの加工を施すこともデザイン上好ましい。

【0073】インクの充填には加圧法および減圧法いずれもが使用できる。なお、インクの充填にタンク本体のいずれかにインク充填口を設けることは他のインクカートリッジ開口部を汚すことがないので好ましい。インク充填後のインク充填口は、プラスチックあるいは金属材料にて栓することが好ましい。

【0074】交換型インクカートリッジの構成および形状は本発明の範囲から逸脱することなく各種の変形を行うことができる。

【0075】本実施例の効果をまとめると以下のようになる。

【0076】〔ジョイントフリーによる効果〕

(1) タンク交換がスムーズに行える。

【0077】(2) ヘッドへの負荷が低くレジ調整済のヘッドがずれない。

【0078】(3) タンクのジョイント開口部およびヘッドジョイント部の精度がラフでよく部品の歩留りが高くなりコストが低下できる。

【0079】(4) 本体キャリアッジのインクタンク装填部ガイド精度がラフでよく部品歩留りが高まりコストを低下させることができる。

【0080】〔圧接シール効果〕

(1) タンク装着中のインク蒸発が抑制され長期間使用できる。

【0081】(2) タンク装着時あるいはタンク装着中のインク洩れを抑制し、装置内の汚染を防止できる。

【0082】すなわち、インクジェット記録ヘッドは文字および画像を形成させるために装置内で調整され固定

されているので、その固定状態に影響を与える外力が働くことを極力さなければならぬ。この要求は本実施例のようにインクジェット記録ヘッドを複数配列したカラー画像形成用の一体型ヘッドの場合にはより厳しくなる。

【0083】従って本実施例によれば、インクカートリッジの取り付けまたは交換の際にインクカートリッジ本体がインクジェット記録ヘッドのジョイント部としてのインク供給管2200に突き当たるなどの外力、すなわちインクカートリッジ内の負圧発生部材を押し込む力以外の外力がインクジェット記録ヘッドに加わるのを防止することができる。

【0084】特に複数のインクジェット用記録ヘッドを内蔵した記録ヘッドユニットはカラー画像形成用として有用であるが、各ヘッドのレジ調整にはより厳しい精度が要求される。たとえ一つのヘッドの調整済の固定が緩和された場合も、そのカラー画像の品位は著しく低下してしまうからである。したがって、このようなインクジェットヘッドユニットへの本発明の交換型インクカートリッジの適用に際してはその交換型インクカートリッジのインクジェット記録ヘッドに対する、あるいは該ヘッドからの着脱時あるいは使用期間中を通して記録ヘッドにかけける力を必要最低限とすべきである。

【0085】なお、交換型インクカートリッジが長期間に亘って記録装置に装填されている場合には前述したようにヘッドジョイント部とインクカートリッジ開口部との間隙からインクの蒸発が懸念されるが、以下に示す本発明における簡易圧接構成を採用することによりインクの蒸発を十分に抑制できる。

【0086】次に、図8～図9を用いて本発明の交換型インクカートリッジの他の実施例を説明する。

【0087】図8～図9は、いずれも交換型インクカートリッジ6000とインクジェット記録ヘッドとの連結構造の要部を示す断面図である。

【0088】図8の(a)において、インクジェットヘッドユニットIJUの円筒状のインク供給管2200の外周面2200aの一部には、簡易圧接部材2202が配設されている。この簡易圧接部材2202は、インク供給管2200の半径方向外方に突出し、かつ一方の面をインクジェットヘッドユニットIJUのヘッド固定壁2201と接触する板部2202aと、この板部2202aの他方の面にインク供給管2200の長さ方向に向けて突出する断面三角形状の突状部2202bとから構成され、いずれの部位も上記インクカートリッジ6000およびインクジェットヘッドユニットIJUをそれぞれ構成する材料よりも硬度的に柔らかい材料から形成されている。連結時には、突状部2202bはその頂部がインクカートリッジ6000の外壁面であって開口部6002の近傍に当接する。

【0089】簡易圧接部材2202を図8の(a)に示

した構造とすることにより、インクカートリッジ6000の着脱時にはヘッドへの外力は負圧発生部材6003を押し当てる力のみとなる。また、取り付け終了時においてもインクカートリッジ6000の外壁と簡易圧接部材2202の突状部2202bがわずかに接触しているのみであり、同図でいう水平方向にわずかに外力がかかるだけである。したがって、インクカートリッジ6000の装着中にインクジェットヘッドユニットIJUにかかる力は負圧発生部材6003を押し当てる力とインクカートリッジ6000に接触するわずかな力のみとなる。インクカートリッジ6000の押し当て量を調整することによりその力は実質的に調整可能である。

【0090】なお、インクカートリッジ外壁と簡易圧接部材2202とは簡易的に圧接されていればよく、部分的な微小な間隙があってもインク蒸発を所望通りに抑制することも可能であるので差し支えない。また、この間隙からインクカートリッジ内への空気の流入があってもインクカートリッジの性能には後述するように響くことはない。

【0091】上記実施例では、インクカートリッジとインクジェットヘッドユニットとの連結構造を図8の(a)に示す構造としたが、上述したように、このような構造に限定されない。

【0092】図8の(a)に示したように、記録ヘッド側にジョイント部としての簡易圧接部材を設けるなどの変形、変更を施した例としては、図8の(b)～(d)に示す構造を挙げることができる。図8の(b)においては、簡易圧接部材2202の突状部2202bが断面略円形(全体ではリング状)となっており、また図8の(c)においては、簡易圧接部材2202自体が断面略円形(全体ではドーナツ状)となっている。また、図8の(d)においては、簡易圧接部材2202自体が断面三角形状(全体では略円錐状)となっており、インク供給管2200の先端に向かうに従って縮径しているため、開口部6002の内縁とインク供給管2200の外周面との間隙CL内に挿入され、簡易圧接部材2202の外周面が開口部6002の内縁に当接している。図8の(e)においては、インク供給管2200の外周面に断面L字状の簡易圧接部材2202が配設されている。この簡易圧接部材2202は、インク供給管2200の半径方向外方に突出する板部2202aと、この板部2202aから後方に延びかつ内周がインク供給管2200の外周面に固定された円筒部2202cとから構成されており、いずれも上記インクカートリッジ6000および記録ヘッドをそれぞれ構成する材料よりも硬度的に柔らかい材料から形成されている。この例においては、開口部6002内にインク供給管2200を挿入する際に簡易圧接部材2202の板部2202aが変形しながら開口部6002の内縁を乗り越えてゆき、板部2202aにより開口部6002にインク供給管2200に係合さ

れる。この係合は、簡易圧接部材2202の板部2202aの変形によりなされているため、解除も容易に行える。しかしながら、インクカートリッジと記録ヘッド結合時に、インクカートリッジが記録ヘッドに与える負荷を考えると、図8(a)～(b)の例が最適である。

【0093】また、他の連結構造としては、図8の(a)～(b)に示したインクジェットインクジェットヘッドユニットIJU側に圧接部材を設ける構成ではなく、インクカートリッジ6000側に圧接部材を設ける構造をも挙げることができる。すなわち、先の図8の(a)に示した簡易圧接部材2202とほぼ同様の構成を有する簡易圧接部材がインクカートリッジの外壁に固定され、突状部の頂部はインクジェットヘッドユニットIJUのヘッド固定壁に当接する構成である。また、図8の(b)に示した簡易圧接部材自体が断面円形のものを開口部6002の内縁に固定しても良い。

【0094】さらに、他の連結構造としては、図9の(a)～(d)に示すように上記インクカートリッジ6000およびインクジェットヘッドユニットIJUの双方の変形、変更依存した構造をも挙げることができる。図9の(a)においては、開口部6002の外縁部に壁部材6002bをインクカートリッジ6000およびインクジェットヘッドユニットIJUをそれぞれ構成する材料よりも硬度的に柔らかい材料により形成し、開口部近傍に設け、さらに、インク供給管2200の外周面にインク供給管2200の半径方向外方へ延びる円板部とこの円板部の最外縁部からインク供給管2200の長さ方向に沿って前方に延びる円筒部とから構成された簡易圧接部材2202を設けた構造となっている。簡易圧接部材2202の円筒部の前端部は、カートリッジ装着時にカートリッジ6000の開口部6002の周囲の壁部材6002bの外側に当接している。図9の(b)においては、この例の壁部材6002bは開口部6002の近傍のカートリッジ6000の構成壁のうち、開口部6002の周縁部を除いて肉薄に形成し、先の図9の(a)に示した簡易圧接部材2202類似の部材を組合せた構造となっている。図9の(c)においては、先の図9の(b)に示した例とは逆に開口部6002の周縁部のみを肉薄に形成し、これにより形成された切り欠き部分に、インク供給管2200の外周面からその半径方向外方へ延びる円板部からなる簡易圧接部材2202の周縁部を係合させる構造となっている。図9の(d)においては、カートリッジ6000の構成壁のうち、開口部6002の内側面6002aの中央部分に切り欠き部分を形成し、この切り欠き部分にインク供給管2200の外周面に設けられた簡易圧接部材2202の一部を係合させる構造となっている。すなわち、この例の簡易圧接部材2202は、インク供給管2200の外周面に固定された円筒部とこの円筒部の外周中央部分からその半径方向外方へ延びる円板部とから構成され、上記切り欠

き部分には円板部の外縁部分が係合されるようになっている。

【0095】上述したように、別部材としての簡易圧接部材および開口部の周辺部位を構成する材料としては、インクカートリッジ6000およびインクジェットヘッドユニットIJUをそれぞれ構成する材料と同一材料を用いることは可能であるが、簡易圧接時に記録ヘッドにかかる力を緩和するためにインクカートリッジ6000およびインクジェットヘッドユニットIJUをそれぞれ構成する材料よりも硬度的に柔らかい材料を用いることが好ましい。

【0096】上記別部材としての簡易圧接部材を構成する材料としては、インク蒸発を抑制するためにガス透過率の低い材料を選択することがより好ましい。また、上述したように、インクカートリッジ6000とインクジェットヘッドユニットIJUとの連結(ジョイント)に別部材としての簡易圧接部材を介在させる場合には、その部材は初期状態、すなわち連結時においてインクカートリッジ6000またはインクジェットヘッドユニットIJUのいずれの側にも任意に取り付けられ、その形状、寸法もインクカートリッジ6000とインクジェットヘッドユニットIJUの形状、寸法などを考慮したうえで任意に決められる。さらに、別部材としての簡易圧接部材をインクジェットヘッドユニットIJUのインク供給管2200に取り付ける場合には、固定する必要はなく、むしろ可動自在である方が望ましい。

【0097】前述した図5に示した構成は、本発明に使用されるインクタンクの最適なものの一つである。すなわち開口部6002と供給管2200との間に空隙を有しているからであり、これにより、記録ヘッドの位置精度に影響を及ぼすような力をインクタンク挿入時に与えにくくなる。この構成に対して図8、図9に示した簡易圧接部材を設けたとしても、上述の効果は損なわれず、インク蒸発やインク漏れの問題が改善されることになる。

【0098】図10は本発明のインクジェットヘッドユニットのより好ましい実施例の外観を示す斜視図である。本実施例では、インクジェットヘッドユニットIJUの圧接部材2202は、ユニットIJUの一側壁に一系列に配列された4本のインク供給管2200の基部と一体に設けられている。各インク供給管2200は、前述したようにその先端部より基部側の径が絞込まれた、ラッパ状をなしており、さらにその絞り込み部分には、ジョイント部としてのインク供給管2200が交換型インクカートリッジとしてのインクタンク6000の開口部6002内に押し込まれた際に、開口部6002を封止してインクタンク6000とユニットIJUとを連結固定するための接着封止剤2203が配されている。ユニットIJUの上記一側壁には、インクタンク6000との固定の際の位置決め用の凹部2204と凸部220

5とが形成されている。一側壁の反対側の壁にはヘッドキャリッジHCの位置決め凸部HC1に突き当たって位置決めするための位置決め凹部が形成されているが、図10には図示せず、図11に図示する。

【0099】図11は図10に示したインクジェットヘッドユニットIJUをヘッドキャリッジHC上に装着した記録装置の要部を示す部分断面図である。図11において、インクジェットヘッドユニットIJUは、ヘッドキャリッジHCの位置決め凸部HC1に位置決め凹部2400を当接させて位置決め固定されており、このユニットIJUに対してインクカートリッジ6000が装着され、かつ、ヘッドキャリッジHC上に載置されている。ヘッドキャリッジHCのうち、インクタンク6000が載置される部分の構造を詳述すると、ほぼ平坦面を有する搭載部HC2と、この搭載部HC2の端部に図面上方に突出する突出部HC3とから構成されている。この突出部HC3の上部には図面右側に下がるスロープHC4が形成されている。また、突出部HC3は、後に詳述するインクタンク6000の開口部6002を有する壁と反対側の壁を、インクタンク6000がユニットIJUにより強固に連結するように押圧するための部材である。インクタンク6000がヘッドキャリッジHCに装着される際には、インクタンク6000の開口部6002内にユニットIJUのインク供給管2200を挿入した後、固定されたユニットIJUに対してインクタンク6000を押し付け、インクタンク6000の下部角部をヘッドキャリッジHCのスロープHC4を滑らせながらインクタンク6000を押し下げようとする。これにより、インクタンク6000を確実に固定することができると共に、開口部6002を確実に密閉することもできる。

【0100】なお、本実施例では、図11に示すように、インク供給管2200と圧接部材2202との間に段差を設け、接着封止剤2203の塗布を容易ならしめたが、塗布方法によっては段差がなくてもよいのは説明するまでもないことである。

【0101】次に、これまでに述べてきた本発明の構成に用いることにより、相乗的に効果が得られる、インクタンクの構造の好ましい変形例と、前述した構成のインクタンクにも共通する作用説明を含めて以下説明する。

【0102】まず、インクジェットヘッドとインクカートリッジの結合機構として図11の圧接部材としてのシーリング部材2202がインクタンクとインクジェットヘッドとの間に介在している構成を提供した。ここで、変形可能なシーリング部材2202が変形された状態で、外部に対して液体流出を確実に防止することが好ましい。また、ヘッドの供給管がインクタンク内に挿入された場合に空間部が開口部近傍のインクタンク内部に形成される場合は、前述した材料のように、大気よりも加圧された際に若干の気体透過性を示すものが良い。これ

は、環境変化によって、タンク内部の圧力が上昇した際に、加圧されたインクがタンクの大気連通部側へ集中する傾向を、若干の気体透過性により圧力緩和し、インクの供給管側への移動を促進できることによるものと考えられる。

【0103】また、上記タンク構成、特に、上記微小連通部を形成する仕切り壁に対向する側に、インク供給用開口或は、供給管による負圧発生体の圧縮（または圧縮可能）領域を存在させる構成とすることで、第2収納室のインクが負圧発生体内に安定した実質的なインク供給路を確保し、これをより安定させる構成として、インクカートリッジの下面に関して上記インク供給用開口が上記微小連通部よりも上方に位置させる構成にあって、シーリング部材2202の若干の気体透過性は、通常の気体透過阻止作用となるので、実質的な密閉構造の第2収納室の気体液体交換の条件を一層安定したものにすることができ、供給管の吸収体圧縮領域のインク供給性を確保できるものと考えられる。この観点からは、前述のシーリング部材2202の若干の気体透過性は、完全な気体封止材料としても良い。

【0104】なお、本発明で云う「供給管」は、多孔質部材に挿入されるインクジェット特有の挿入管はもとより、カートリッジに付設され負圧発生体を圧縮変形せしめている弁構造や連結部材と係合する機構をも含むものである。

【0105】さらに、使用されるインクの条件を検討したところ、インク表面張力が 55 dyne/cm （ 25°C ）を越えると、インクの環境依存度や内部構成によるインク移動は顕著となるが、 55 dyne/cm 以下であると、臨界的にこの問題が見られなくなり、特に 50 dyne/cm 以下であると、環境にも左右されずに、極めて安定した特性を示したのである。一方、その 55 dyne/cm 以下であると、確実に負圧発生部材中に安定した進行性を示し、負圧発生部材中に気体である空気と液体であるインクとの気液界面が形成される構成の場合に特にその界面を長期にわたって安定したものにできる効果が認められた。これは、上記微小連通部から上記第1収納室内の上記負圧発生部材対向位置まで延在する気液交換促進構造を有するカートリッジにおいては、その構成と相乗的に機能して、直線的な界面を安定した状態で形成できるので、好ましいのものであった。逆に、前提構成用のインク表面張力が 20 dyne/cm （ 25°C ）を下回ると、通常使用では、インク漏れが生じないものの、衝撃が加わるような場合においては、インク漏れ現象が見られ、 20 dyne/cm 以上であると、このような衝撃があっても、前提構成の利点とインク特性との相乗効果によってインク漏れが防止されることが判明した。また、特に、 25 dyne/cm 以上 50 dyne/cm 以下では、環境にも左右されずに、極めて安定した特性を示した。

【0106】以下、前記図4ないし図11に示した本発明の構成におけるインクカートリッジに設けられた負圧発生室のより好ましい構成を中心とした説明を行う。

【0107】ここで、図12に示したように負圧発生部材収容室24に配されている大気連通部近傍の負圧発生部材23は、インクが与えられず、インクを保持しない領域として存在させる。この後、開口13は、ボール14でシールされ開口部22と大気連通部は、同一のシール部材S（異なっても良い）でシールされている。図12は使用前のインクカートリッジを示したものである。この図でインク収納室26内には、インクが充填されているものとする。図12は、この密閉状態のインクカートリッジ21を示すと共に、これを使用するプリンタの概略図を示している。このインクカートリッジ21には、大気連通部20の近傍に位置する負圧発生体領域23Aが、インクを保持していない領域としてカートリッジ上方角部に設けられている。該領域23Aの下方に位置する負圧発生体領域23Bは、インク供給管（不図示）の挿入により圧縮変形される圧縮可能領域である。これらの領域23A、23B以外の負圧発生体は、他の外的影響がなく充填されたインクを保持する。無論、領域23Bは、大気連通部20の下方で同一面に設けられているインク供給管装着用の開口部22に対向する領域である。また、開口部22は、微小連通部28よりも上方に位置しており、上述した特徴構成のそれぞれをすべて有している。

【0108】図12のカートリッジ21は、前述したシール部材Sを除去することで、使用可能になるが、上記領域23Aがインクを保持していないために、シール除去時の振動や圧力変化があってもインクを漏らすことがない。

【0109】本実施例は、インクカートリッジの保存状態や使用状態に関わらず、従来の技術水準を一掃する技術観点として、負圧発生部材の該大気連通部近傍領域をインクを保持していない領域とすることで、環境条件の変動に対して、インクカートリッジ内のインクが大気連通部から漏れることを防止できる。特に、シール部材が大気連通部を密閉している場合に対しては、シール部材のはがれ防止効果もある。また、使用状態にあっては、この領域は、大気がカートリッジ内に必要に応じた量が効率よく供給でき、インクジェットカートリッジ内の負圧変化を抑制する効果もある。この大気連通部近傍領域は、全くインクによる濡れがないものであると、インク自体の浸透速度をより減速させることができるので好ましいが、インクにより予め濡らした後にそのインクを除去した領域としても良い。

【0110】また、本実施例は、上記微小連通部を形成する仕切り壁に対向する側に、インク供給用開口或は、供給管による負圧発生体の圧縮（または圧縮可能）領域を存在させる構成とすることで、インク収納室26のイ

ンクが負圧発生部材収容室24の負圧発生体内に安定した実質的なインク供給路を確保でき、これをより安定させる構成として、インクカートリッジの下面に関して上記インク供給用開口が上記微小連通部よりも上方に位置させることを挙げることができる。この配置関係の作用は、実質的なインク移動方向を一定化でき、インク収納室26のインクがすべて消費でき、この消費後は、インク収納室26内の空気が対向する開口側に移動するように介在することで、結果的に、負圧発生体内のインクを消費可能にして、残存インクを減少できることにある。

【0111】特に、上記微小連通部を形成する仕切り壁からこの壁に対向する側に向かって、負圧発生体の供給管によって圧縮されない領域、負圧発生体の供給管によって圧縮される領域を、この順に有することで、圧縮されない領域には前述した1方向のインク供給路が形成でき同様の効果が得られ、さらに圧縮領域のインク確保能力によって一層インク残量を減少できる。

【0112】本実施例のインクジェットプリンタは、図12に示したように上記カートリッジ21を装着したことに応じて、自動的或は手動的にカートリッジ内からのインク排出をヘッドを介して吸引手段による吸引或は吐出によって実行するヘッド回復手段HRを有している。これにより負圧発生体内のインク状態をプリント前に修正できるので、カートリッジの放置状態に左右されずに、カートリッジ本来の上記機能を利用することができる。

【0113】図12で、走査型のキャリッジCRに保持されたインクジェットヘッドHDに対して装着されるタンク21は、先に説明したシールテープSを除いたものである。キャリッジ上に装着されたタンク21はヘッドのインク供給管が上記開口部22を通して、負圧発生部材23の圧縮可能領域23Bを圧縮変形させる。本例では、負圧発生部材23を微小連通部28側へ変形させる。この時、タンクの着脱検知手段（機械的または電気的な公知の検知手段によって代用されるので不図示とした）によって装着信号LPがプリンタ制御手段CCに入力される。これに依りて、記録開始前にヘッド回復手段HRが作動してタンク21内のインクを排出して、タンク内インクの状態を改善する。

【0114】図13（A）、（B）は、それぞれ本発明実施例のプリントあるいはインク供給状態の可能な状態傾斜範囲を示すもので、図中の40は水平面を示している。本発明にとってより好ましい状態は、微小連通部が下方側に位置していることで、理想的には水平面40に対してカートリッジ下面で平行となることが良い。しかし、実用上は、本例の如く、2室構成の場合、（A）、（B）の図の如き水平面とインクカートリッジ底面のなす角度 θ はそれぞれ $0 \leq \theta \leq 15$ 度の範囲まで使用上の不都合がない。走査型キャリッジ上に載置して移動させる場合は $0 \leq \theta \leq 5$ 度の範囲が好ましい。

【0115】また、このようにカートリッジが傾斜して設けられた場合が、何らかの予期せぬ要因により引き起こされたとしても、前述したようにインク供給管220とインクカートリッジの開口部602は間隙を有する構成、すなわちフリージョイント構成となっているので、記録ヘッドにかかる負荷を小さいものとすることができ、設置状態に影響を与えない。従って、インク供給性能は安定したまま良好に維持される。

【0116】上述した本発明の実施例の負圧発生部材は、複数の部材構成でも良いが、互いの間の界面（部材間界面）が生じると大気移動がそこに生じるため都合が生じ易い場合があるので、好ましくは負圧発生部材は単一の多孔室体であることが良い。

【0117】また、インク収容室は、相対的に負圧発生部材収納室よりもインクを多量に含むものであれば、実質的にインクを収納する室として含めることもできる。

【0118】次にインクカートリッジ内のインク消費形態を図14を用いて説明する。

【0119】図14（a）は、インクジェット記録ヘッドへインクを供給するインク供給管であるジョイント部材27を実施例のインクカートリッジ本体21の開口部22に挿入して負圧発生部材23に圧接し、インクジェット記録装置が稼動可能になった状態を示す模式断面図である。なおジョイント部材27の端部開口部にはインクカートリッジ内のゴミを排除するためにフィルターが設置されていることが望ましい。インクジェット記録装置が稼動すると、インクジェット記録ヘッドのオリフィスからインクが吐出され、インクタンクにインク吸引力が発生する。インク29はこの吸引力によりインク収容部26からリブ25の端部とインクカートリッジ底部11との隙間部28を通り負圧発生部材収容部24へ、そして負圧発生部材23を通してジョイント部材27内に引き込まれインクジェット記録ヘッドへ供給される。これにより隙間部28以外は密閉しているインク収容部26の内部の圧力が低下し、インク収容部26と負圧発生部材収容部24との間に圧力差を生ずる。記録が継続すると、その圧力差は上昇を続けるが、負圧発生部材収容部24は大気連通孔20により大気に開放されているため、図14（b）に示すように空気は負圧発生部材23を通してリブ25とインクカートリッジ底部11との隙間部28からインク収容部26に入る。この時点で、インク収容部26と負圧発生部材収容部24との間の圧力差が解消される。インクジェット記録中はこの動作が繰り返され、ある一定の負圧がインクカートリッジ内に得られる。また、インク収容部26内のインクは、インク収容部26内の壁面に付着するインク以外は、ほぼ全て使用できるためインク使用効率が向上する（図14（c））。非記録時は、負圧発生部材23自身の毛細管力（あるいはインク-負圧発生部材界面でのメニスカス力）などが発揮され、インクジェット記録ヘッドからイ

ンクが漏れることを抑制する。

【0120】図15（A）は、本発明の他の実施例のインクジェット用インクカートリッジ本体の縦断面図、図15（B）は同横断面図、図16はリブの表面を示す断面図である。インクジェット用インクカートリッジ本体21001には、インク収容部1006と負圧発生部材収容部1004との隔壁であるリブ1005の一部に大気導入溝1031と負圧発生部材調整室1032とが形成してある。大気導入溝1031は、リブ1005の中間部分からリブ1005の端部、即ちインクカートリッジ底部1011との隙間部1008まで、負圧発生部材収容部1004側に形成されている。そしてリブ1005の大気導入溝1031の近辺に接する負圧発生部材1003との間に、えぐられたような形状の負圧発生部材調整室1032が形成されている。

【0121】負圧発生部材1003は負圧発生部材収容部1004の内面に当接されることから、例えば負圧発生部材1003が不均一に挿入されていたとしても図15（B）に示すように、負圧発生部材1003の当接（圧縮）力が部分的に緩和されることになる。このため、ヘッドからインクを消費し始めると、負圧発生部材1003に含浸されているインクが消費され負圧発生部材調整室1032まで達する。その後もインクが消費し続けると負圧発生部材調整室1032により負圧発生部材1003の当接力が緩和されている部分から大気がインクメニスカスを破りやすくなっており、速やかに大気導入溝1031に大気が導入され負圧のコントロールが容易になる。

【0122】以上のようなリブ、負圧発生部材調整室、あるいはこれらと同等の機能を有する他の構成、を含めて、気液交換促進構造と総称する。該気液交換促進構造を有するインクカートリッジにおいては、インク液位最適領域は、負圧発生部材収容室である第1収納室とインク収容部である第2収納室との連通部上方の第1収容室側壁面に配設された気液交換促進構造の頂部の高さを調整することによって得ることができる。

【0123】インク液位最適領域を制御する手段としては、前述したように負圧発生部材の圧縮方向、および圧縮率を変更する等の方法があるが、気液交換促進構造の頂部位置の調整の方がより確実かつ再現性よく目的を達成できる。勿論、これらの方法を組み合わせることによりインク液位を上記最適領域にしてもよい。

【0124】次に、その一例を示す。

【0125】以上説明してきたように、本発明では、インク供給時にインク収容部中のインクと大気とが、安定かつ、すみやかに気液交換されることが可能となり、その結果、インク供給部における内圧を安定して制御することが可能となり、記録ヘッドにおける吐出安定性の良い、しかも、高速印字が可能となった。また、外部環境の変化に対する、インクタンク内の圧力変化に対して

も、インク漏れが発生することのない、インクタンクを提供することが可能となった。

【0126】次に上述した各実施例のインクタンクに対して好ましく用いられるインクに求められる物性について説明する。好ましいインクとは負圧発生部材中におけるインク界面がインクタンクの振動に対しても安定であり、また環境変化に対して気液界面が安定な挙動を示すことが望ましい。そのため、インクの表面張力は $20 \text{ dyne/cm} \sim 55 \text{ dyne/cm}$ が良く、より好ましくは $25 \text{ dyne/cm} \sim 50 \text{ dyne/cm}$ である。インクの表面張力がこの範囲にある場合には、ヘッドオリフィス部のメニスカスが破れてその結果、非印字時にヘッドオリフィス部からインクがあふれるといった現象は生じない。

【0127】代表的な水溶性有機溶剤の $20 \sim 30^\circ\text{C}$ の表面張力として、エタノール (22 dyne/cm)、イソプロパノール (22 dyne/cm)、シクロヘキサノール (34 dyne/cm)、グリセリン (63 dyne/cm)、ジエチレングリコール (49 dyne/cm)、ジエチレングリコールモノメチルエーテル (35 dyne/cm)、トリエチレングリコール (35 dyne/cm)、2-ピロリドン (47 dyne/cm)、N-メチルピロリドン (41 dyne/cm)があるが、これらの溶剤と水を混合して所望の表面張力を得る。

【0128】界面活性剤を用いてインクの表面張力をコントロールする方法を説明する。例えば、ソルビタンモノラウリン酸エステルでは水に対して1%の添加で 28 dyne/cm が得られ、ポリオキシエチレンソルビタンモノラウリン酸エステルでは水に対して1%の添加で 35 dyne/cm が得られる。またアセチレノールEH (アセチレングリコールのEO付加物)では1%以上の添加で 28 dyne/cm が得られる。さらに低表面張力が必要な場合にはフッ素系界面活性剤例えばサーフロンS-145 (旭ガラス社製 パーフロロアルキルEO付加物)では水に対して0.1%で 17 dyne/cm が得られる。ただしその他の添加物により多少表面張力は変化するので適宜調整する。

【0129】図17は、上記各実施例で示した記録ヘッドユニットを搭載可能なインクジェット記録装置IJRAの外観斜視図である。

【0130】図17において駆動モータ5013の正逆回転は駆動力伝達ギア5011、5009を介してリードスクリュウ5004に伝達され、これを回転させ、またキャリッジHCはリードスクリュウ5004のラ線溝5005に係合するピン(不図示)を有する。これによって、キャリッジHCは装置長手方向に往復移動される。5002は記録ヘッドユニット内の各記録ヘッドの前面をキャップするキャップであり、不図示の吸引手段によりキャップ内開口を介して記録ヘッドの吸引回復を

行うために用いられる。キャップ5002はギア5008等を介して伝達される駆動力により移動各記録ヘッドの吐出口面を覆うことができる。5017はクリーニングブレードであり、5019はこのブレードを前後方向に移動可能にする部材であり、本体支持板5018にこれらが支持されている。ブレードは、この形態に限られず、周知のクリーニングブレードが本例に適用できることはいうまでもない。

【0131】これらのキャッピング、クリーニング、吸引回復は、キャリッジがホームポジションに移動したときにリードスクリュウ5005の作用によってそれらの対応位置で所望の処理が行えるように構成されているが、周知のタイミングで所望の作動を行うようにすれば、本例にはいずれも適用できる。

【0132】キャリッジHCに装着された記録ヘッドユニットの接続パッド4502は、キャリッジHCに設けられた接続板5030が所定軸回りに回転することにより、その接続パッド5031と接続し、電気的接続がなされる。この接続はコネクタ等を用いないため、記録ヘッドに不要な力が作用しない。

【0133】(その他)なお、本発明は、特にインクジェット記録方式の中でも、インク吐出を行わせるために利用されるエネルギーとして熱エネルギーを発生する手段(例えば電気熱変換体やレーザ光等)を備え、前記熱エネルギーによりインクの状態変化を生起させる方式の記録ヘッド、記録装置において優れた効果をもたらすものである。かかる方式によれば記録の高密度化、高精細化が達成できるからである。

【0134】その代表的な構成や原理については、例えば、米国特許第4723129号明細書、同第4740796号明細書に開示されている基本的な原理を用いて行うものが好ましい。この方式は所謂オンデマンド型、コンティニュアス型のいずれにも適用可能であるが、特に、オンデマンド型の場合には、液体(インク)が保持されているシートや液路に対応して配置されている電気熱変換体に、記録情報に対応して核沸騰を越える急速な温度上昇を与える少なくとも1つの駆動信号を印加することによって、電気熱変換体に熱エネルギーを発生せしめ、記録ヘッドの熱作用面に膜沸騰を生じさせて、結果的にこの駆動信号に一对一に対応した液体(インク)内の気泡を形成できるので有効である。この気泡の成長、収縮により吐出用開口を介して液体(インク)を吐出させて、少なくとも1つの滴を形成する。この駆動信号をパルス形状とすると、即時適切に気泡の成長収縮が行われるので、特に応答性に優れた液体(インク)の吐出が達成でき、より好ましい。このパルス形状の駆動信号としては、米国特許第4463359号明細書、同第4345262号明細書に記載されているようなものが適している。なお、上記熱作用面の温度上昇率に関する発明の米国特許第4313124号明細書に記載されて

いる条件を採用すると、さらに優れた記録を行うことができる。

【0135】記録ヘッドの構成としては、上述の各明細書に開示されているような吐出口、液路、電気熱変換体の組合せ構成（直線状液流路または直角液流路）の他に熱作用部が屈曲する領域に配置されている構成を開示する米国特許第4558333号明細書、米国特許第4459600号明細書を用いた構成も本発明に含まれるものである。加えて、複数の電気熱変換体に対して、共通するスリットを電気熱変換体の吐出部とする構成を開示する特開昭59-123670号公報や熱エネルギーの圧力波を吸収する開孔を吐出部に対応させる構成を開示する特開昭59-138461号公報に基いた構成としても本発明の効果は有効である。すなわち、記録ヘッドの形態がどのようなものであっても、本発明によれば記録を確実に効率よく行うことができるようになるからである。

【0136】さらに、記録装置が記録できる記録媒体の最大幅に対応した長さを有するフルラインタイプの記録ヘッドに対しても本発明は有効に適用できる。そのような記録ヘッドとしては、複数記録ヘッドの組合せによってその長さを満たす構成や、一体的に形成された1個の記録ヘッドとしての構成のいずれでもよい。

【0137】また、本発明の記録装置の構成として、記録ヘッドの吐出回復手段、予備的な補助手段等を付加することは本発明の効果を一層安定できるので、好ましいものである。これらを具体的に挙げれば、記録ヘッドに対してのキャッピング手段、クリーニング手段、加圧或は吸引手段、電気熱変換体或はこれとは別の加熱素子或はこれらの組み合わせを用いて加熱を行う予備加熱手段、記録とは別の吐出を行なう予備吐出手段を挙げることができる。

【0138】また、搭載される記録ヘッドの種類ないし個数についても、例えば単色のインクに対応して1個のみが設けられたものの他、記録色や濃度を異にする複数のインクに対応して複数個数設けられるものであってもよい。すなわち、例えば記録装置の記録モードとしては黒色等の主流色のみの記録モードだけではなく、記録ヘッドを一体的に構成するか複数個の組み合わせによるかいずれでもよいが、異なる色の複色カラー、または混色によるフルカラーの各記録モードの少なくとも一つを備えた装置にも本発明は極めて有効である。

【0139】本発明においては、上述した各インクに対して最も有効なものは、上述した膜沸騰方式を実行するものである。

【0140】さらに加えて、本発明インクジェット記録装置の形態としては、コンピュータ等の情報処理機器の画像出力端末として用いられるものの他、リーダ等と組合せた複写装置、さらには送受信機能を有するファクシミリ装置の形態を採るもの等であってもよい。

【0141】

【発明の効果】以上説明したように、本発明の交換型インクカートリッジの構成とすれば、インクジェットヘッドの取付位置に精度的な影響を与えて印字品質を低下させることなく、インクカートリッジの着脱を行うことが可能である。すなわち、インクカートリッジとインクジェットヘッドの結合時に、不用意な方向からの外力をインクジェットヘッドに加えることなくインクカートリッジを装着できる。

【0142】そして、本発明の交換型インクカートリッジは、単独の物流時にも高い信頼性を維持し、簡易な構造でインクの残量検知可能なインク使用効率の高い交換型インクカートリッジとなる。

【0143】また、記録時および非記録時においても適度の負圧を使用初期から使用終了までの間維持して高速記録に対応し、インクジェット記録装置の使用環境条件においてもインク洩れの無い交換型インクカートリッジとなる。

【0144】さらに、交換型インクカートリッジの取り扱い性が良好で、インクジェット記録装置への脱着時においてもインク洩れなどがなく、インクジェット記録装置への装着誤動作のない交換型インクカートリッジとなる。

【0145】本発明によれば、記録手段のジョイント部の外壁と圧接部材を接着封止することにより、万が一、最悪の環境においてタンク内圧が上昇してインクが押し出されそうになっても、インクが漏出することはなく、信頼性の高いインクジェットヘッドユニットを提供することができる。

【図面の簡単な説明】

【図1】本発明を適用可能なインクジェットヘッドの要部の一例を示す断面図である。

【図2】図1に示すインクジェットヘッドを複数個を装着してなるインクジェットヘッドユニットを、そのハウジングを除いて示す分解斜視図である。

【図3】インクジェットヘッドユニットの分解斜視図である。

【図4】インクジェットヘッドユニットとインクカートリッジの接続形態を説明するための斜視図である。

【図5】インクジェットヘッドユニットとインクカートリッジが接続して構成されるインクジェットヘッドユニットの断面概略図である。

【図6】インクジェットヘッドに設けられたインク供給管とインクカートリッジとの結合を示す断面図である。

【図7】内部に多孔質部材を収容したインクカートリッジを示す断面図である。

【図8】本発明の交換型インクカートリッジとインクジェットヘッドユニットとの連結構造の他の例を示す断面図である。

【図9】本発明の交換型インクカートリッジとインクジ

エットヘッドユニットとの連結構造の他の例を示す断面図である。

【図 10】本発明のインクジェットヘッドユニットユニットの最も好ましい実施例の外観を示す斜視図である。

【図 11】図 10 に示したインクジェットヘッドユニットユニット I J U をヘッドキャリッジ H C 上に装着した記録装置の要部を示す部分断面図である。

【図 12】本発明インクジェットカートリッジと、それを用いたインクジェットプリンタの概略説明図である。

【図 13】(A), (B) は、本発明インクカートリッジの使用状態の傾斜可能範囲を説明するための断面図である。

【図 14】(a), (b), (c) は、夫々本発明のプリント状態における変化を順に示す説明図である。

【図 15】(A) はさらに他の実施例インクジェット用インクカートリッジ本体の縦断面図で、(B) はインクジェット用インクカートリッジ本体の横断面図である。

【図 16】図 15 (A), (B) のリブの表面を示すインクカートリッジ本体の断面図である。

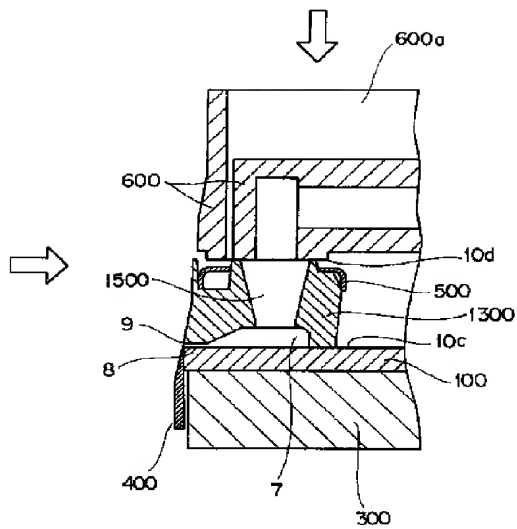
【図 17】本発明のインクジェットプリント装置の一例を示す斜視図である。

【符号の説明】

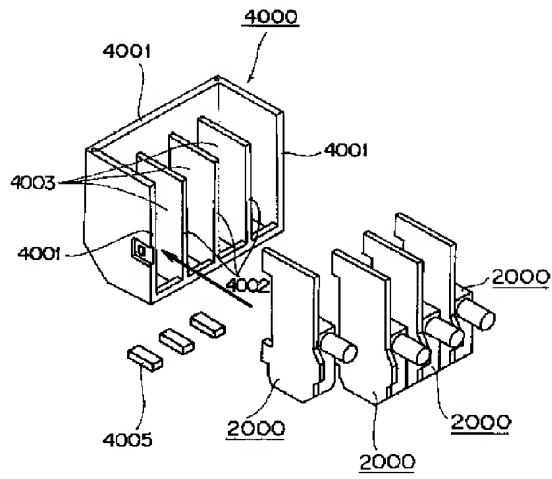
1 熱エネルギー発生素子
7 液室 (ヘッド部)
8 インク路
9 吐出口 (オリフィス)
11, 1101, 6011 インクカートリッジ底部
13 開口
14 ボール
20, 1013, 6013 大気連通部
21, 1001, 6000 インクカートリッジ
22, 1002, 6002 開口部 (インクカートリッジ)
23, 1003, 6004 負圧発生部材収容室
25, 1005, 6005 リブ (仕切壁)
26, 1006, 6006 インク収容部
27, 1007, 2200 インク供給管
28, 1008, 6008 微小供給管
29, 6009 インク
40 水平面
100 ヒータボード
300 支持基板
400 オリフィスプレート
500 押えばね
600 インク供給部材

700 フィルタ
1031 大気導入溝
1032 負圧発生部材調整室
1300 インク供給口 (液室への)
2000 インクジェットヘッド
2200a インク供給管外壁
2201 ヘッド固定壁
2202 簡易圧接部材
2202a 板部
2202b 突状部
2203 接着封止材
2204 凹部
2205 凸部
2400 凹部
4000 インクジェットヘッドユニット枠
4001 ユニット外壁板
4002 ユニット内壁板
4003 ヘッド保持部
4005 多孔質部材
4006 側面ハウジング
4007, 4010 凹部
4008, 4505 掛止板
4009 孔
4011 孔
4501 端子
4502 接続パッド
4504 ピン
4506 上ハウジング
4514 コネクタ
4515 ヘッド側端子
5002 キャップ
5004 リードスクリュ
5005 ら旋溝
5008 ギア
5017 クリーニングブレード
5018 本体支持板
5019 ブレード移動部材
5030 接続板
5031 接続パッド
40 I J U インクジェットヘッドユニット
H C, C R キャリッジ
H C 1 位置決め凸部
H C 2 搭載部
H C 3 突出部
H C 4 スロープ

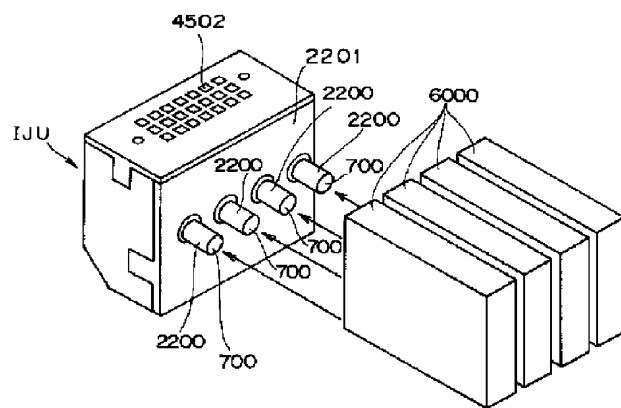
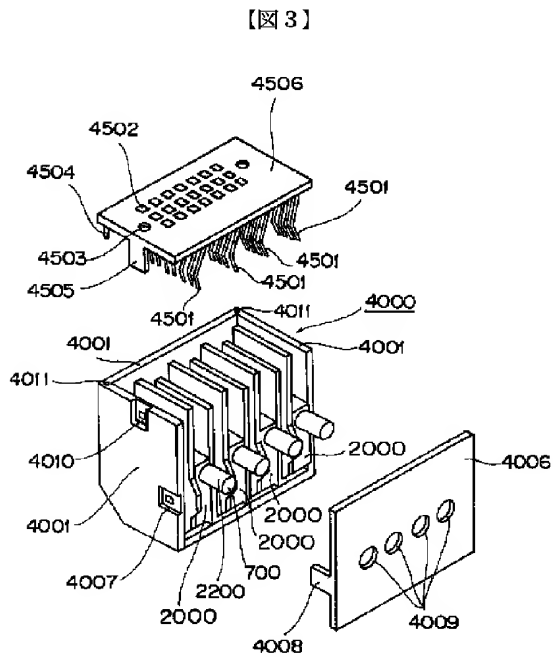
【図 1】



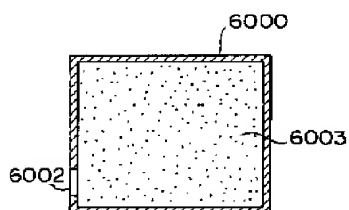
【図 2】



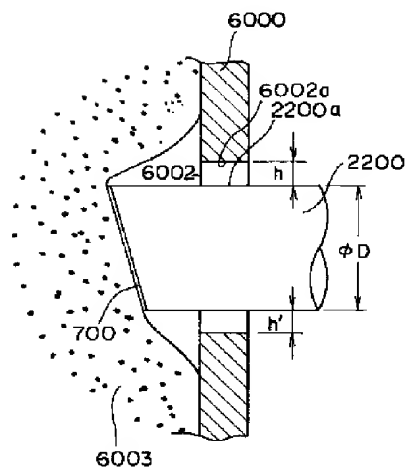
【図 4】



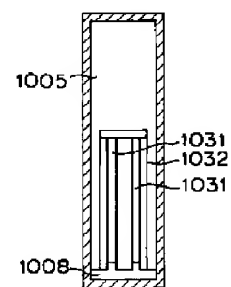
【図 7】



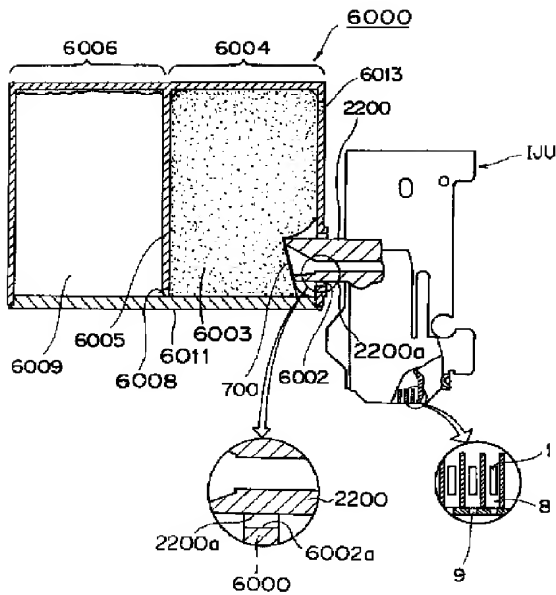
【図 6】



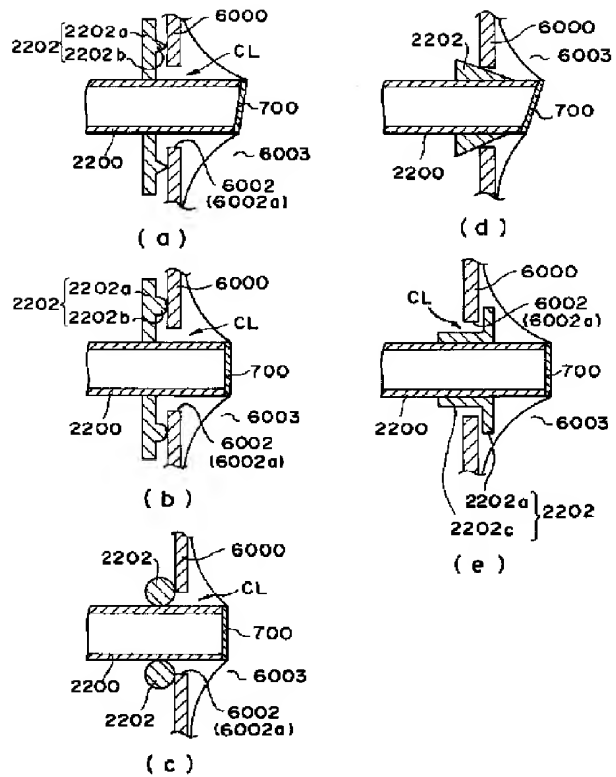
【図 16】



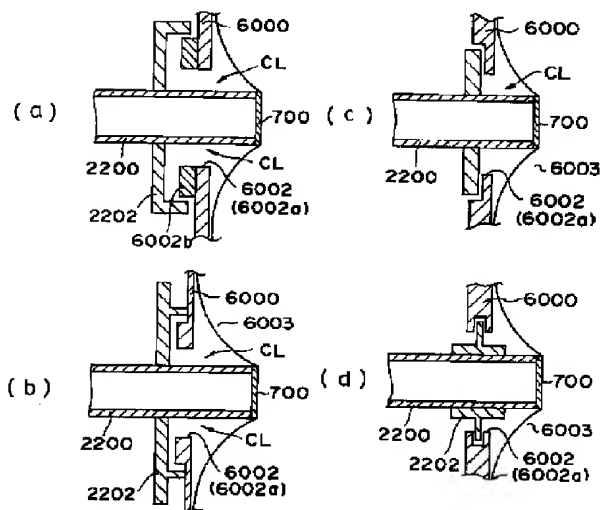
【図5】



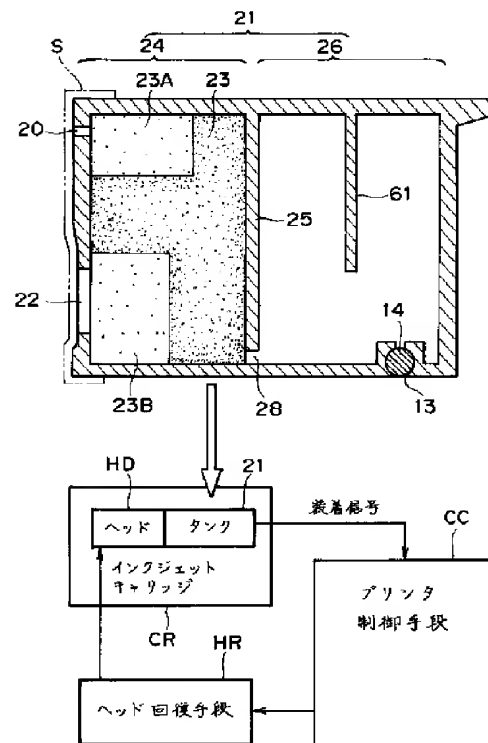
【図8】



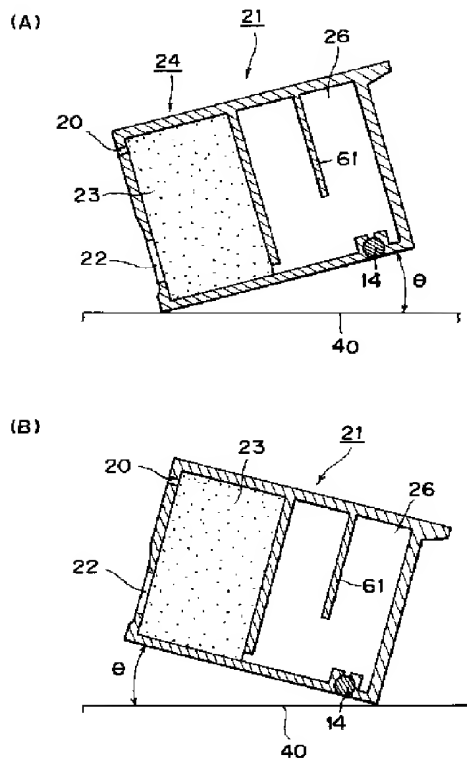
【図9】



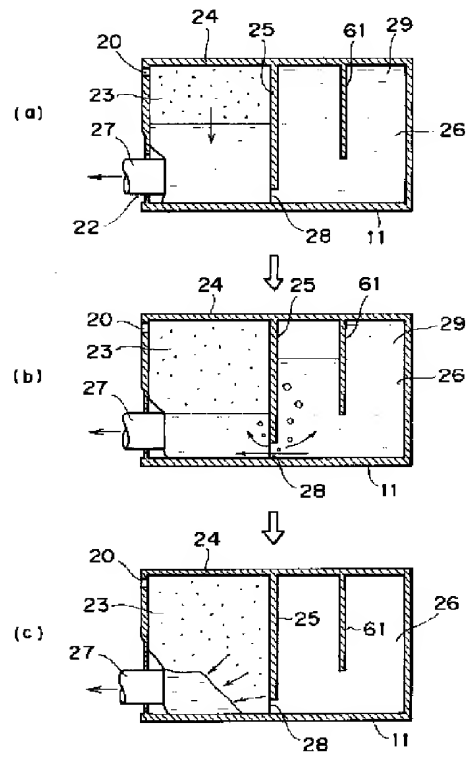
【図12】



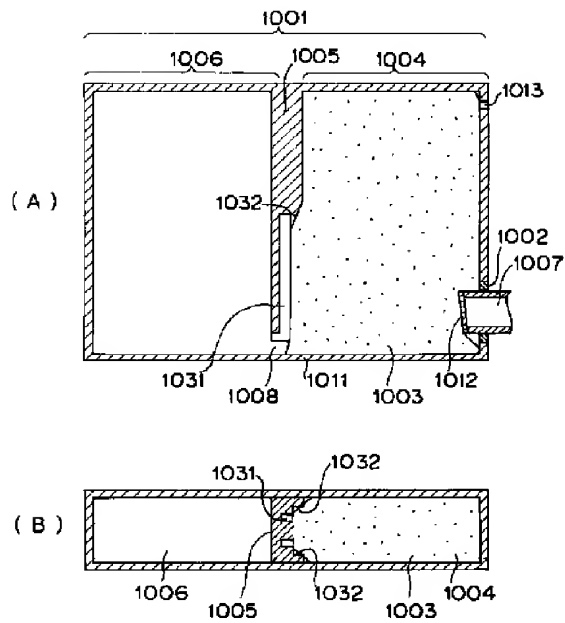
【図13】



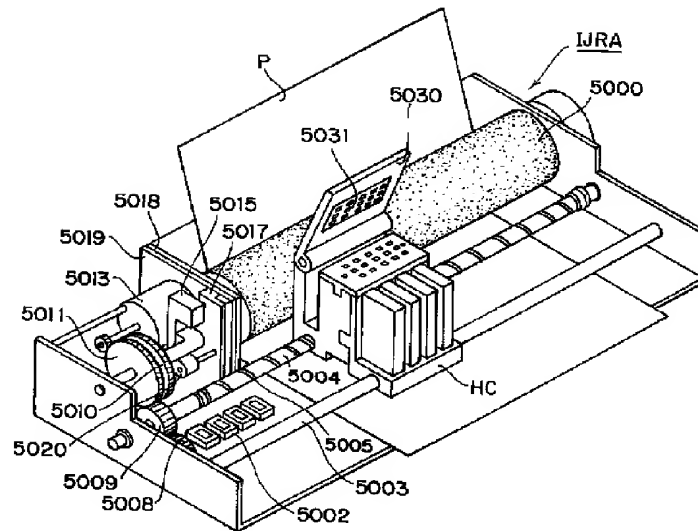
【図14】



【図15】



【図 17】



フロントページの続き

(72)発明者 池田 雅実
 東京都大田区下丸子3丁目30番2号 キヤ
 ノン株式会社内